

Exhibit I

**IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION**

<div style="display: flex; justify-content: space-between;"><div style="width: 60%;"><p>DYFAN, LLC,</p><p style="text-align: center;">Plaintiff,</p><p style="text-align: center;">v.</p><p>TARGET CORPORATION,</p><p style="text-align: center;">Defendant.</p></div><div style="width: 40%; text-align: center; vertical-align: middle;">:</div></div>	:	C.A. No. 6:19-cv-00179-ADA
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**DECLARATION OF DR. BENJAMIN GOLDBERG WITH
REGARD TO CERTAIN CLAIM CONSTRUCTIONS**

TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	SUMMARY OF OPINIONS	1
III.	EXPERIENCE AND QUALIFICATIONS	2
IV.	MATERIALS REVIEWED	3
V.	PRIORITY DATES OF ASSERTED PATENTS	4
VI.	PERSON OF ORDINARY SKILL IN THE ART	4
VII.	CLAIM TERMS IN DISPUTE	5
A.	Legal Standards - Claim Construction and Indefiniteness	5
B.	Legal Standards - Functional Claiming	6
C.	“Code” / “Computer Code” / “Application” Claim Limitations in Asserted Patents	8
1.	The ’584 Provisional Disclosure	9
2.	The ’197 Application Disclosure	18
3.	“application” / “computer code” / “code” “. . . cause display of an option”	29
4.	“application” / “computer code” / “code” “. . . receive an indication of a receipt . . . of the one or more messages”	33
5.	“application” / “computer code” / “code” “. . . causing to be output, via the at least one mobile device, the visual information based on the particular location-relevant information”	37
6.	“code” “. . . cause to be output, via the at least one mobile device, the second visual information based on the second location-relevant information”	43
7.	“application” “. . . permit a determination as to whether the one or more mobile device application actions including causing to be output the visual information is triggered”	49
D.	“System” Claim Limitations in Asserted Patents	54
1.	“system” “. . . subsequent output of different visual information is caused as the at least one mobile device is moved among a plurality of the facilities of the building”	54
2.	“system” “. . . the visual information is automatically caused to be output”	58
3.	“system” “. . . the output of the visual information is conditionally caused based on whether a mobile device-specific threshold has been met”	62
4.	“system” “. . . the option and the user input permit the user to [determine/influence] whether [the control of the/the] one or more mobile device application actions is [triggered/caused/based on user feedback information]” / “system” “output” “both the first visual information and the second visual information . . . based on user feedback information received from a user of the at least one mobile device”	65
5.	“system” “. . . the particular location-relevant information is located based on the at least on[e] value”	70

I, Dr. Benjamin Goldberg, hereby declare as follows:

I. INTRODUCTION

1. My name is Dr. Benjamin Goldberg, and I have been retained as an expert witness on behalf of Target Corporation (“Target” or “Defendant”).

2. I have been informed that Dyfan, LLC (“Dyfan” or “Plaintiff”) has brought a patent infringement lawsuit against Target in the United States District Court for the Western District of Texas. I understand that the asserted patents are U.S. Patent Nos. 9,973,899 (the “’899 Patent”) and 10,194,292 (the “’292 Patent”). I collectively refer to the ’899 Patent and ’292 Patent as the “Asserted Patents”). I understand that the asserted claims of the ’899 Patent are claims 1-4, 7, 9, 11-19 and 23-30, and that the asserted claims of the ’292 Patent are claims 1-8, 10-21 and 24-30.

3. I have been asked by Defendant to provide my expert opinions relating to certain terms and phrases appearing in the asserted claims of the ’899 Patent and the ’292 Patent. I am being compensated at my standard consulting rate of \$475 per hour plus reimbursement for expenses. No portion of my compensation is dependent or otherwise contingent upon the results of this matter or the specifics of my testimony.

4. My opinions are set forth in this declaration and are based on my general knowledge and experience, as well as the materials listed below in Section IV. I submit this declaration in connection with Defendant’s opening claim construction brief.

II. SUMMARY OF OPINIONS

5. My opinions are more fully described throughout this declaration, but a summary of my opinions is as follows:

- A person of ordinary skill in the art (“POSITA”) of the ’899 and ’292 Patents would have had a Bachelor of Science degree in computer science or a similar technical field together with two years of educational practicum or work

experience in the field of software development (including programming for client-server systems, databases and networks), or related areas.

- For identified functions recited in various claim limitations, the respective claim does not connote definite structure for performing the identified function.
- For these same claim limitations, neither the '584 Provisional nor the specification of the '197 Application discloses an algorithm for programming a general purpose computer or microprocessor (*i.e.*, the claimed system, code and application code) to perform the claimed function.

III. EXPERIENCE AND QUALIFICATIONS

6. In forming my opinions expressed in this Declaration, I have relied upon my knowledge, training, and over 35 years of academic and professional experience. While my qualifications are stated more fully in my curriculum vitae (Ex. A), here I provide a brief summary of my qualifications:

7. I am a tenured Associate Professor in the Department of Computer Science of the Courant Institute of Mathematical Sciences at New York University ("NYU") in New York. I have held this position since September 1994. From 1987 to 1994, I was an Assistant Professor in the Department of Computer Science at NYU.

8. Since September 2014, I have been the Director of Graduate Studies for the MS programs in the Department of Computer Science (although I was on sabbatical for the 2018-2019 academic year), having previously served in that role from September 2009 through August 2012. I served as the Director of Undergraduate Studies for the Department of Computer Science from September 1995 through August 1998 and from September 2003 through August 2006. In addition, I have held a one-year visiting professorship at the Institut National de Recherche en Informatique

et en Automatique (“INRIA”), a national laboratory in France, and was twice appointed to a month-long position as an invited professor at the Ecole Normale Supérieure, a university in Paris.

9. I received my Doctoral degree in Computer Science from Yale University, New Haven, Connecticut, in 1988, having previously received Master of Science and Master of Philosophy degrees in Computer Science from Yale in 1984. My undergraduate degree from Williams College in 1982 was a Bachelor of Arts degree with highest honors in Mathematical Sciences.

10. I have taught courses and lectured at the undergraduate and graduate level in programming languages, program design, object-oriented programming, database languages, web services, user interfaces, and other areas related to the technology at issue in this matter. Additional information concerning the computer science courses that I have taught and my professional publications and presentations in the field of computer science is set forth in my current Curriculum Vitae, a copy of which is attached as Appendix A.

IV. MATERIALS REVIEWED

11. In preparing this declaration, I considered the following materials:

- '899 Patent
- '292 Patent
- U.S. Patent Application No. 13/410,197
- U.S. Provisional Patent Application No. 61/517,584
- Dyfan’s Preliminary Infringement Contentions for the Asserted Patents (dated June 14, 2019)

V. PRIORITY DATES OF ASSERTED PATENTS

12. I understand that the '899 Patent is a parent patent of the '292 Patent. I also understand that the parent patent application of the '899 Patent, and the grandparent patent application of the '292 Patent, is U.S. Patent Application No. 13/410,197, which was filed on March 1, 2012 (the "'197 Application"). I further understand that, with the exception of the respective "Related Applications" and "Summary" sections, the '197 Application, '899 Patent, and '292 Patent share a common specification. I also understand that the '197 Application, '899 Patent, and '292 Patent each claim priority to, and incorporate by reference in its entirety, U.S. Provisional Patent Application No. 61/517,584, which was filed on March 1, 2011 (the "'584 Provisional").

13. I have been informed and understand that Dyfan contends that the earliest possible priority date for the Asserted Claims of the Asserted Patents is at least as early as March 1, 2011 in view of the filing date of the '584 Provisional. Thus, in forming my opinions, I considered the level of knowledge, skill and common terminology used by persons of ordinary skill in the art as of Dyfan's contended time of the invention (March 2011). My opinions contained in this Declaration do not change regardless of whether the invention date of the Asserted Claims of the Asserted Patents is March 1, 2012 (the filing date of the '197 Application) or March 1, 2011 (the filing date of the '584 Provisional).

VI. PERSON OF ORDINARY SKILL IN THE ART

14. I understand from Defendant's counsel that terms in the Asserted Patents' claims must be read as they would have been understood by a person of ordinary skill in the art ("POSITA") at the time of the invention. *See* paragraphs 12-13 above.

15. I have also been advised that a POSITA is a hypothetical person to whom the claimed subject matter pertains with the capability of understanding the scientific and engineering principles applicable to the pertinent art. I understand that the following factors may be considered

in determining the level of ordinary skill: type of problems encountered in the art; prior art solutions to those problems; speed with which innovations are made; sophistication of the technology; and educational level of active workers in the field. I also understand that not every factor may be present and that one or more factors may predominate.

16. In my opinion, a POSITA would have had a Bachelor of Science degree in computer science or a similar technical field together with two years of educational practicum or work experience in the field of software development (including programming for client-server systems, databases and networks), or related areas. A POSITA would also be familiar with the technologies (e.g., user interfaces, databases, networks, etc.) underlying existing data communication networks, including those involving mobile devices. Under this definition, I am at least a POSITA, both now and as of 2011. I have applied this definition of a POSITA in rendering my opinions.

VII. CLAIM TERMS IN DISPUTE

A. Legal Standards - Claim Construction and Indefiniteness

17. I am not an attorney. However, the laws of claim construction and indefiniteness have been explained to me, and my understanding is as follows.

18. I understand that the claims of a patent define the limits of the patentees' exclusive rights. In order to determine the scope of the claimed invention, courts typically construe (or define) claim terms, the meaning of which the parties may dispute. I understand that claim terms should generally be given their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention and after reading the patent and its prosecution history.

19. However, I further understand that claims must be construed in light of and consistent with the patent's intrinsic evidence. Intrinsic evidence includes the claims themselves,

the written disclosure in the specification, the patent's prosecution history, including the prior art that was considered by the United States Patent and Trademark Office ("USPTO"), and the prosecution history of related patents including patents that share the same specification as the patent-at-issue. I understand that extrinsic evidence may also be considered when construing claims and that evidence may include, for example, technical dictionaries, treatises, and expert testimony.

20. I understand that the claims of a patent are presumed to be valid, and that invalidity of a claim must be proven by clear and convincing evidence.

21. I understand that a claim limitation is indefinite if the claim, when read in light of the specification and the prosecution history, fails to inform with reasonable certainty persons of ordinary skill in the art about the scope of the invention.

B. Legal Standards - Functional Claiming

22. As I stated above, I am not an attorney. However, the laws of functional claiming have also been explained to me, and my understanding is as follows.

23. I understand that one or more terms within a patent claim may be written in means-plus-function form, even if the claim term does not include the specific word "means." I understand that if a claim element does not contain the term "means," it is presumed not to be a means-plus-function limitation that is subject to 35 U.S.C. § 112, paragraph 6. However, I understand that this presumption can be rebutted by showing that the claim element recites a function without reciting sufficient structure for performing that function, from the perspective of one of ordinary skill in the art.

24. It is my further understanding that certain terms have been explicitly recognized by courts as "nonce" words, which I understand to be verbal constructs that are not recognized as the name of structure and are effectively a substitute for the term "means for." While claim language,

including preceding adjectives or other modifiers, that further defines a generic term can sometimes add sufficient structure to avoid 35 U.S.C. § 112, ¶ 6, not just any preceding words or functional language will suffice. I understand that the proper inquiry is whether the words of the claim itself, when read in light of the specification, connote to a POSITA definite structure for performing the identified functions.

25. I understand that construing means-plus-function claim terms generally involves two steps. First, the particular claimed function must be identified. Second, the corresponding structure disclosed in the specification as performing that function must be identified. I understand that in order for a structure to qualify as the corresponding structure, the structure disclosed in the specification must be clearly linked to and associated with the function claimed by the means-plus-function limitation. I understand that in order to meet the definiteness requirement of 35 U.S.C. § 112, the specification must include a disclosure sufficient for one skilled in the art to understand that the structure disclosed in the specification performs the recited function.

26. I understand that a patent claiming a computer-implemented means-plus-function limitation must disclose an algorithm for performing the claimed function in order to meet the definiteness requirement of 35 U.S.C. § 112. I understand that this is because general purpose computers can be programmed to perform different tasks in different ways, so merely disclosing and claiming a general purpose computer provides no limit on the scope of the claim. As a result, I understand that the corresponding structure for a computer-implemented function is not a computer, but is a specific algorithm that allows a general purpose computer or microprocessor to perform the claimed function. I understand that the specification can express the algorithm in any understandable terms including as a mathematical formula, in prose, or as a flow chart, or in any other manner that provides sufficient structure for performing the function (*e.g.*, a step by step

explanation of how the function is preformed). I also understand that an algorithm is a step-by-step procedure for accomplishing a given result.

27. I understand that statements that merely recite outcomes or results, without disclosing how those outcomes or results are achieved, are not algorithms, but rather mere statements of function. I also understand that examples in a specification which merely enable a POSITA to make and use the claimed invention do not constitute disclosure of an algorithm for programming a general purpose computer or microprocessor to perform the claimed function. I understand that a patent claim is invalid as being indefinite if the specification fails to disclose in sufficient detail an algorithm for programming the computer or microprocessor to perform the claimed function.

C. “Code” / “Computer Code” / “Application” Claim Limitations in Asserted Patents

28. I have been informed and understand that the parties dispute the application of 35 U.S.C. 112, ¶ 6 to the various claim limitations in the Asserted Patents that recite “code” (or “computer code” or “application”) that (1) is “configured for execution by at least one of a plurality of mobile devices”, and (2) “when executed” is “configured to” perform various functions.

29. I have been instructed by counsel to consider whether, for identified functions recited in these various claim limitations, the claim connotes definite structure for performing the identified function to a POSITA. If, in my opinion, the claim does not connote definite structure for performing the identified function, then I have been instructed by counsel that the claim phrase is subject to 35 U.S.C. 112, ¶ 6.

30. For claim phrases that I have determined that the claim does not connote definite structure for performing the identified function, I have been further instructed by counsel to

determine whether the specification discloses an algorithm for programming a general purpose computer or microprocessor to perform the particular claimed function.

1. *The '584 Provisional Disclosure*

31. At Dyfan's contended time of the invention (March 2011), the '584 Provisional identified various problems with acknowledged prior art systems:

[C]onventional web based services are based on the Internet Protocol. This protocol defines, among other things a process for addressing devices connected to the a network so that one device can send data packets to any other device as long as both devices have appropriate network addresses. While this approach is highly useful, and it is responsible in large part for the explosive growth in the use of the Internet, it is inadequate in situations where the terminal addresses may not be known, when the location of terminal changes frequently, or when the network nodes in a localized network may change frequently; these situations represent a substantial portion of the potential operational envelope for mobile devices. ('584 Provisional at p. 13.)

In the various addressed network systems describe above (cellular, WiMAX, etc), the terminal must determine its location and then provide the location in geographic coordinates or as geo-referenceable mapping data (e.g. street address, intersection, etc.) to the server that would like to deliver location aware data. This procedure requires a full handshake transaction, whereby the mobile terminal would request certain information from a content server and the content server would deliver the information to that specific terminal. An example for this procedure is the Google maps application on the Apple iPhone, where the phone sends its GPS location to the service provider in order to get the relevant map data for display. Unfortunately, this process is very inefficient since all information for a specific location has to be transmitted n-times for n-terminals. (*Id.* at p. 16.)

Collection of data from specific locations is even more complicated and inefficient because the server seeking to collect information from terminals at a specific location must first determine the network addresses of the terminals at that location. This process typically involves transmitting a broadcast message to all terminals in the vicinity of an RSU requesting that they send data about that location. (*Id.* at p. 16.)

It is obvious that today's systems do not provide a convenient method of directly sending data messages to a certain physical location, and do not support the efficient collection certain data messages from specified physical locations. (*Id.* at p. 18.)

32. The “Summary of the Invention” section of the ’584 Provisional identifies the solution to set the invention apart from these prior art systems and solve these problems:

The present invention addresses the challenges mentioned above. (’584 Provisional at p. 18.)

The present invention describes the relationship and transactions between data/content providers (providers), data/content aggregators (aggregators), network input/output units (network I/O units) that comprise data collection elements and data distribution elements, and mobile terminal units (mobile terminals) to support a novel approach to network data routing based on location and various service attributes. (*Id.* at p. 18.)

A network formed according to the present invention resolves internal routing information based on location (coordinates, physical location, logical location, functional or commercial description, etc) attributes of a network I/O unit, or mobile terminal(s) in local proximity of a network I/O unit, such that the sender may send data to the mobile terminal in proximity of the network I/O unit based only on the location attributes of the network I/O unit and the service attributes (type, preferences, authentication, etc) of the mobile unit. (*Id.* at p. 18.)

A network formed according to the present invention resolves internal routing information based on location of an network I/O unit, such that the a user may receive data from mobile terminal(s) in proximity of the network I/O unit based only on the location attributes of the Network I/O unit, and the service attributes of the mobile unit. (*Id.* at p. 18.)

33. The “Detailed Description of Presently Preferred Embodiments of the Invention” section of the ’584 Provisional summarizes the invention’s solution:

The invention described herein provides a means and function for delivering messages to certain physical locations and for collecting data from certain locations. The approach uses a location header in the communication process that a location aware proxy server can understand to route messages to and from mobile terminals via a variety of wireless and wire-line communication networks. (’584 Provisional at p. 21.)

34. The mobile terminals (700) (annotated in green below) are described in the context of Figure 3 (reproduced below) as “connect[ing] to one or more wireless networks using either addressed or broadcast communications” and as “directly communicat[ing]” with “Network I/O

units” (annotated in blue below) such as “DSRC roadside units (RSU 420), cellular towers (520), and WiFi hot spots (620).” (’584 Provisional at p. 22.)

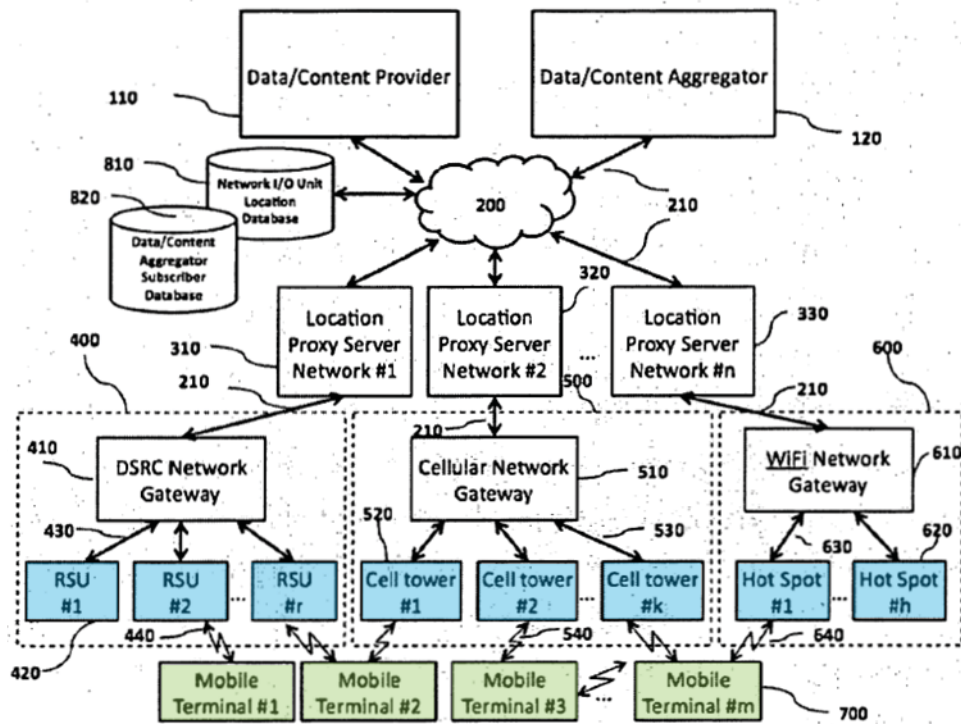


Figure 3 System Architecture

35. Regarding the operation of mobile terminals (700) within this system architecture, the ’584 Provisional includes three figures (Figures 12, 13 and 14) which respectively disclose:

Figure 12: Shows the flow of events for the location based ***data distribution function*** for the preferred embodiment of the present invention.

Figure 13: Shows the flow of events for the location based ***data collection function*** for the preferred embodiment of the present invention

Figure 14: Shows the flow of events for the location based ***message re-broadcast function*** for the preferred embodiment of the present invention.

(’584 Provisional at p. 21 (emphasis added)).

36. Portions of Figures 12 and 13, and the entirety of Figure 14, describe particular operations of mobile terminals (700). Below are excerpts of the relevant portions of these figures and the corresponding text from the ’584 Provisional.

37. Regarding steps 1580 and 1590 of the “location based *data distribution* function” depicted in Figure 12 (excerpt reproduced below), the ’584 Provisional states:

9) At step 1580, Mobile Terminal (700) receives the message broadcast from, or sent by, Network I/O Unit (420,520,620).

10) At step 1590, Mobile Terminal (700) performs actions based on Message Payload (1400), or Header Data (1200, 1300). As shown in steps 1591a through 1591d, such actions may include, singly, collectively, and in any order:

Step 1591a: Display of certain elements of the message content in the form of text, images or video;

Step 1591b: Generation of audio information related to or derived from the message content;

Step 1591c: Production of other types of user interface signals usable by the mobile terminal or its peripheral devices or interfaces;

Step 1591d: Generation and transmission of another message bearing content headers (1100, 1200, 1300), related to, but not necessarily the same as the received message;

Step 1591e: Control of one or more terminal application functions based on the information in the content headers (1100, 1200, 1300); For example, requesting additional terminal specific information from the Network I/O Unit (420, 520, 620), such as security information; decrypting received content, Holding the message until some other criteria is met (for example the location of the mobile unit is within a geographic region specified in the message, or a specific time elapses, etc), and then talking one or more of the actions described in steps 1591a through 1591d, etc. Such actions may also include comparison of the message header information and or message content information to stored user preferences to determine the appropriate actions, which may include no action.

(’584 Provisional at p. 24, Figure 12 (below)).

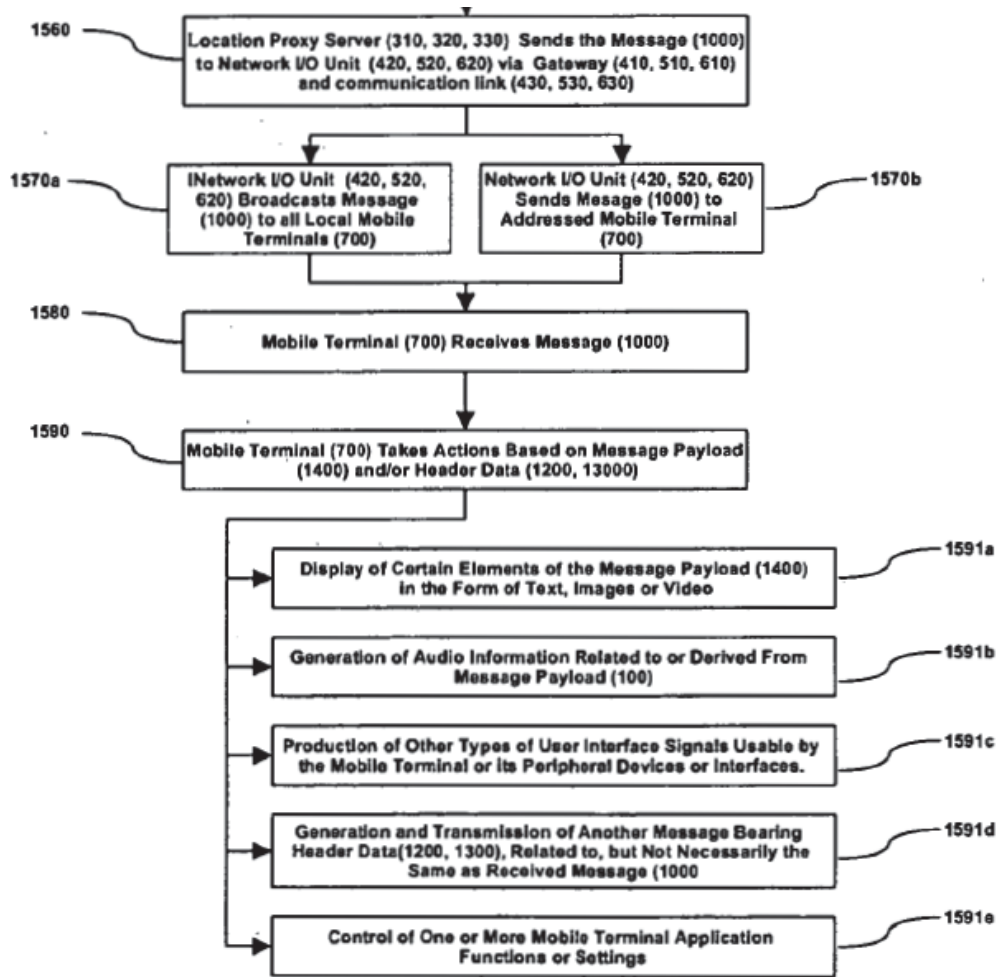


Figure 12 Data Distribution Process

38. Regarding step 1600 of the “location based *data collection* function” depicted in Figure 13 (relevant excerpt reproduced below), the ’584 Provisional states:

1) At step 1600, the Mobile Terminal (700) sends a data message to local Network I/O Units (420, 520, 620). In an alternative embodiment, the mobile terminal may also broadcast the information to other mobile terminals in the same local network or available through ad-hoc networking. In yet another embodiment, the mobile terminal may use a positioning system such as GPS and or a digital map to determine its location and add the location type (e.g. point, area, road link), location data, (e.g. latitude/ longitude, x-y, or other geographical coordinates) and as well as additional parameters (e.g. road link ID) to the message header of such a data message. As shown in steps 1601a through 1601e Mobile Terminal (700) my[sic] generate such data messages on the basis of a variety of events, such as:

Step 1601a: A request by the Network I/O Unit (420, 520, 620);

Step 1601b: Location within a specified geographic region;

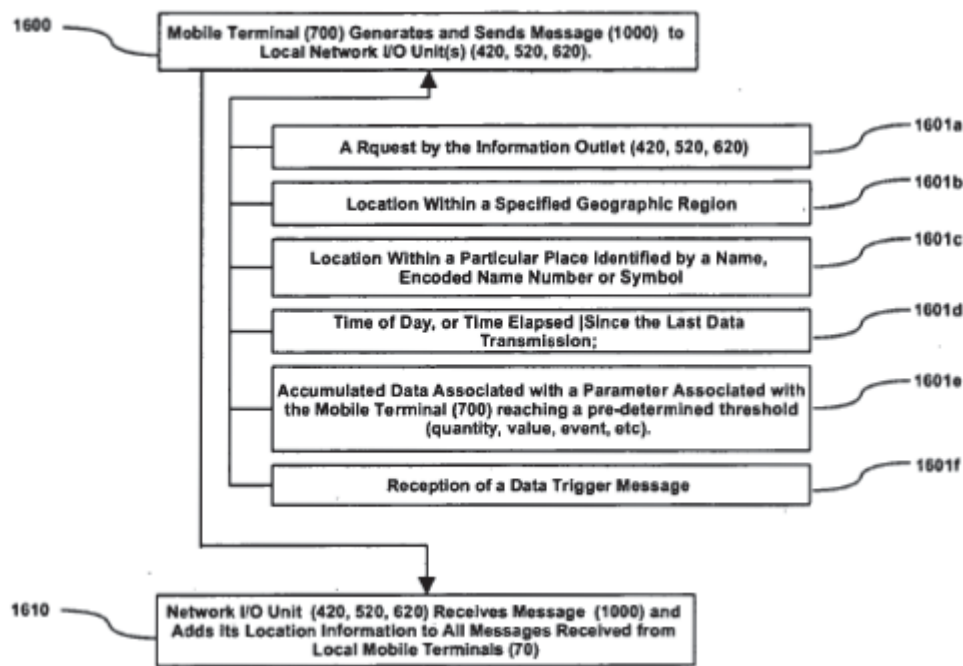
Step 1601c: Location within a particular place identified by a name, encoded name number or symbol or other place attribute;

Step 1601d: Time of day, or time elapsed since the last data transmission;

Step 1601e: Accumulated data associated with a parameter associated with the Mobile Terminal (700) reaching a predetermined threshold (quantity, value, event, etc). One skilled in the art will recognize that the parameters associated with mobile device (700) may include operating parameters for the device or the user, or a vehicle in which the Mobile Terminal (700) is either embedded, connected or being carried;

Step 1601f: Reception of a data trigger message from another mobile device (700) or from a device located in proximity to, or integrated with Network I/O Unit (420,520,620);

('584 Provisional at p. 25, Figure 13 (below)).



39. Regarding steps 1700-1780 of the “location based *message re-broadcast* function” depicted in Figure 14 (reproduced below), the '584 Provisional states:

Assuming a Mobile Terminal (700) has received and acted on a message generated by a Data/Content Provider (110) as described in connection with Figure 12 (e.g. received and displayed the message), the present invention provides a mechanism for Mobile Terminals (700) to distribute such received

messages independently of the presence of Network I/O Units (420, 520, 620). (*Id.* at 26.)

- 1) At step 1700, Mobile Terminal (700) waits to receive a message;
- 2) At step 1710a, Mobile Terminal (700) receives Message (1000) broadcast from, or sent by, Network I/O Unit (420, 520, 620) (Note: This is the same as Step 1580 of Figure 12). Alternatively, at step 1701b, Mobile Terminal (700) receives a Message (1000) broadcast from, or sent by another Mobile Terminal within wireless radio range of Mobile Terminal (700).
- 3) At step 1720, Mobile Terminal (700) examines Header (1100, 1200, 1300), and/or Message Payload (1400), and determines that the message is designated for re-broadcast;
- 4) At step 1730, Mobile Terminal (700) compares Header (1100, 1200, 1300), and/or Message Payload (1400), to a list of cancelled rebroadcast messages received at some earlier time; If the Message (1000) has been cancelled, Mobile Terminal (700) deletes the received message, and returns to step 1700; If not, then it proceeds to step 1740;
- 5) At step 1740, Mobile Terminal (700) generates a random number between -200 and +200, and adds this to re-broadcast repeat interval information contained in the Service Header (1300) measured in milliseconds, this new value is referred to as the Local Repeat Interval; One skilled in the art will recognize that the value of the random number added to the re-broadcast repeat interval depends on the type of network, and that other values could be used to optimize performance based on the transmission and message processing time of the wireless network and the Mobile Terminals;
- 6) At step 1750, Mobile Terminal (700) compares message headers (1100, 1200, 1300), and/or message payload (1400) to any messages received since the subject message was received, if no received messages are the same as the subject message, then the mobile Terminal (700) proceeds to step 1760. If the subject message has been subsequently received after its initial reception, the Mobile Terminal (700) returns to Step 1730.
- 7) At step 1760, the Mobile Terminal compares the Local Repeat Interval to the time elapsed since it last received the same Message (1000) or transmitted the same Message (1000); If the time elapsed since receiving or transmitting the Message (1000) is equal to or greater than the re-broadcast repeat interval, the Mobile Terminal (700) proceeds to step 1760; If not, it returns to step 1730 (i.e. it waits for the Local Repeat Interval to expire);
- 8) At step 1770, Mobile Terminal (700) compares the re-broadcast time expiry information contained in the Service Header (1300) to the current time; If the re-broadcast expiry time is after the current time, it proceeds to step 1780, otherwise it deletes the message and returns to step 1700;

9) At step 1780, Mobile Terminal (700) compares the re-broadcast region information contained in the Location Header (1200) to its current location; if Mobile Terminal (700) is inside the re-broadcast region, it proceeds to step 1790; if not, it returns to step 1730; One skilled in the art will understand that in the preferred embodiment, the re-broadcast region will preferably be geographically separate from the reception region in the vicinity of the Network I/O Unit (420, 520, 620);

10) At step 1790, Mobile Terminal (700) broadcasts Message (1000), and returns to step 1730.

('584 Provisional at pp. 26-27, Figure 14 (below)).

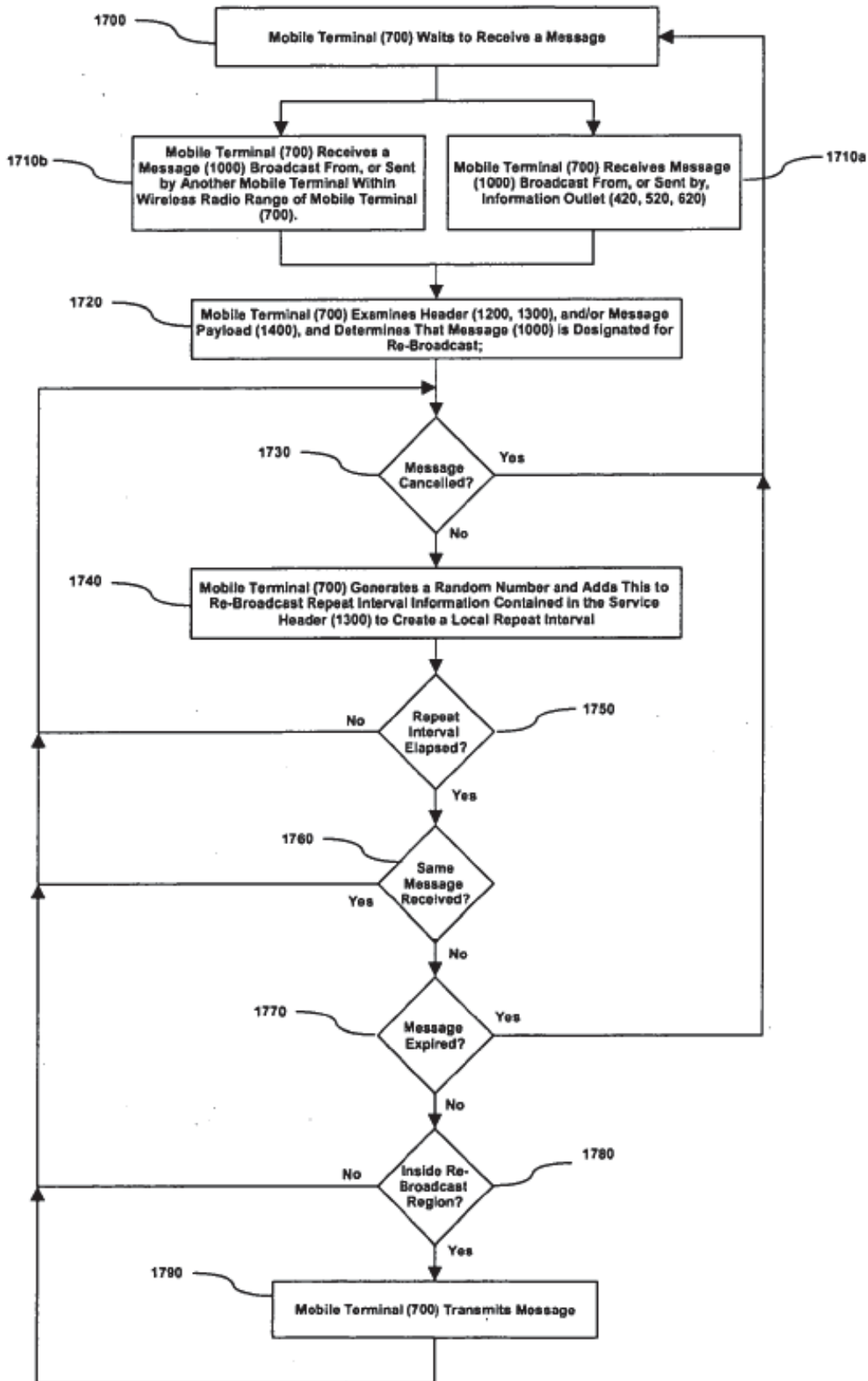


Figure 14 Data Re-Broadcast Process

40. Specifically related to the disputed claim limitations of the Asserted Claims, the '584 Provisional does not use the words “code” or “computer code.” And, with the exception of step 1591e of Figure 12 (excerpt reproduced above), the '584 Provisional only uses the word “application” in the context of acknowledged prior art “mobile applications” (*see* '584 Provisional at pp. 11, 16), and in Figure 11 as a component of software 4200 executing on a microprocessor 4100 of a *proxy server* 4000 (*see also id.* at Figure 3, location proxy server 310, 320, 330), *i.e., not* a mobile terminal, where the “main function of the [proxy server] software (4200) is to provide efficient routing of messages from data providers to mobile terminals or from mobile terminals to data aggregators” (*id.* at p. 30). *See also id.* at Figure 3 (Data/Content Provider 110, Data/Content Aggregator 120).

2. The '197 Application Disclosure

41. To the extent that Dyfan contends that the invention date of the Asserted Claims of the Asserted Patents is March 1, 2012 (the filing date of the '197 Application) rather than March 1, 2011 (the filing date of the '584 Provisional), based on my review of the specification, I provide excerpts from the specification of the '197 Application herein. I also note that the specification of the '197 Application expressly incorporates by reference the “entirety” of the '584 Provisional. '197 Application at para [0001]¹ (p. 1).

42. The specification of the '197 Application includes Figures 12-14 of the '584 Provisional as Figures 13-15 (while deleting certain reference numbers (*e.g.*, for “Network I/O Unit” and “Mobile Terminal”) and revising the reference numbers for the blocks in the flow charts

¹ I note that, in the specification of the '197 Application, the paragraph numbers increase from [0001] to [0065] on pages 1-14, and then start again at [0001] on page 14 through [00128] on page 124. Thus, I include citations to both a paragraph number and a page number in my declaration.

(e.g., steps 1580 and 1590 to steps 1309 and 1310))². In describing Figures 13-15 (as well as *all* of the other Figures), the specification of the '197 Application repeatedly states:

As an option, the [e.g., system 200, method 400, method 1300, method 1400, method 1500, attribute interface 1600, interfaces 1800, etc.] may be carried out in the context of the architecture and environment of the previous Figures and/or any subsequent Figure(s). Of course, however, the [e.g., system 200, method 400, method 1300, method 1400, method 1500, attribute interface 1600, interfaces 1800, etc.] may be carried out in *any desired environment*.

Id. at paras [0027] (p. 5), [0031] (p. 6), [0049] (p. 10), [0061] (p. 13), [0011] (p. 18), [0013] (p. 18), [0015] (p. 19), [0019] (p. 20), [0023] (p. 21), [0029] (p. 22), [0031] (p. 22), [0049] (p. 27), [0052] (p. 28), [0065] (p. 31), [0075] (p. 34), [0089] (p. 38), [00100] (p. 41), [00110] (p. 43-44), [00113] (p. 44), [00122] (p. 47) (emphasis added).

43. Thus, the specification of the '197 Application repeatedly states “the [system/method/message structure/format/interface] may be carried out in *any desired environment*.” *Id.* In doing so, the '197 Application emphasizes that “the environment for implementing” the system (*see, e.g., id.* at [0027] (p. 5), Figure 2), as well as “the environment for carrying out/implementing” the following, are *not* part of the invention:

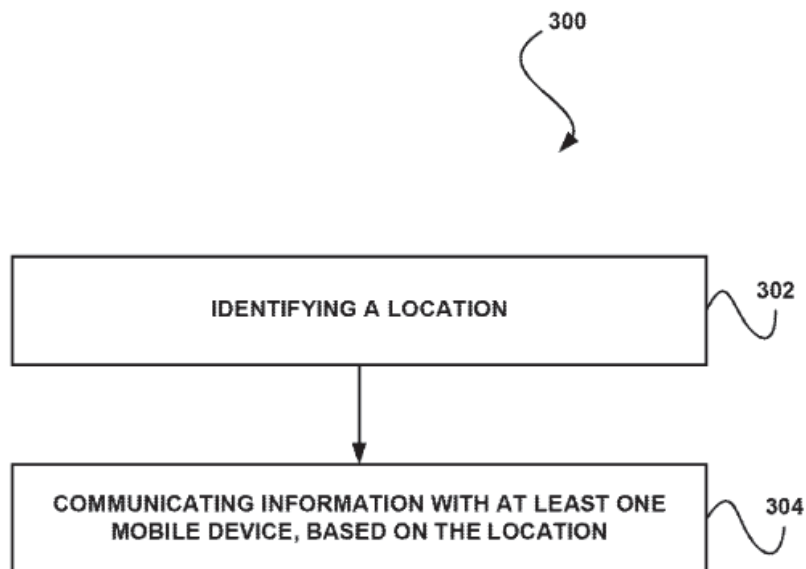
- method of providing a location-based (or relevancy-based) trigger for mobile devices (*see, e.g., id.* at [0031] (p. 6), [0049] (p. 10); Figures 3, 4)
- location and/or relevancy based triggers for mobile devices (*see, e.g., id.* at [0061] (p. 13); Figure 5)
- message structure (*see, e.g., id.* at [0015] (p. 19); Figure 7)
- location/service header format and location/service data encoding format (*see, e.g., id.* at [0019] (p. 20), [0029] (p. 22), [0023] (p. 21), [0031] (p. 22); Figures 8-11)
- hierarchical distribution and collection of information (*see, e.g., id.* at [0011] (p. 18), [0013] (p. 18); Figures 6A-6B)
- location proxy server (*see, e.g., id.* at [0049] (p. 27); Figure 12)
- method for data distribution (*Id.* at [0052] (p. 28)), data collection (*see, e.g., id.* at [0065] (p. 31)), or data rebroadcasting (*see, e.g., id.* at [0075] (p. 34); Figures 13-15)
- service/location attribute interface (*see, e.g., id.* at [0089] (p. 38), [0091] (p. 41); Figure 16)

² The specification of the '197 Application also includes Figures 3-11 of the '584 Provisional as Figures 5-12 respectively (while revising the reference numbers).

- user information delivery interface (*see, e.g., id.* at [00110] (p. 43); Figure 18)

44. In describing Figure 14 (which corresponds to Figure 13 of the '584 Provisional), the specification of the '197 Application also states “[o]f course, ***like every feature disclosed herein, such technique is optional.***” ’197 Application at para [0073] (p. 34) (emphasis added). And, in describing Figures 14 and 15 (which correspond to Figures 13 and 14 of the '584 Provisional), the specification of the '197 Application further states that “***any*** of the location/service attributes and/or parameters disclosed herein (e.g. see non-limiting examples described in connection with Figures 7-11, etc.) may be used in connection with ***any*** one or more of operations [1401-1402a/b/c/d/e/f to conditionally trigger the same / 1501-1503 to conditionally trigger any re-broadcasting] . . . [s]uch triggering may be in response to a request message, preconfigured settings in association with the device, ***and/or any other mechanism.***” ’197 Application at paras [0068] (p. 32), [0078] (p. 35) (emphasis added).

45. Figure 3 of the '197 Application (reproduced below), and the corresponding text at paragraphs [0031]-[0047] (pp. 6-9), is not included in the '584 Provisional. The specification of the '197 Application describes Figure 3 as “illustrat[ing] a method 300 providing a location based trigger for a mobile device.” *Id.* at para [0031] (p. 6).

**FIGURE 3**

46. In describing Figure 3, the specification of the '197 Application states, in part:

As shown in operation 302, a location is identified. In the context of the present description, such location may include *any* location and may be identified in *any desired manner*. (*Id.* at [0032] (p. 6) (emphasis added)).

Moreover, the location may be identified in *any manner*. (*Id.* at [0035] (p. 7) (emphasis added)).

In the context of the present description, the mobile device (or otherwise referred to as mobile device) may be *any device with mobile communication capabilities*. (*Id.* at [0038] (pp. 7-8) (emphasis added)).

Also in the context of the present description, the information may be *any type of information* capable of being communicated (e.g. provisioned, transmitted, broadcasted, messaged, displayed, etc.) with respect to the mobile device. Just by way of example, the information may be content (e.g. an advertisement, coupon, digital media, etc.). As another example, the information may be a service (e.g. mobile communications service, etc.). (*Id.* at [0039] (p. 8) (emphasis added)).

It should be noted that the communication of the information may involve *any type of communication* enabled with respect to the mobile device. (*Id.* at [0040] (p. 8) (emphasis added)).

To this end, information is communicated with a mobile device, based on an identified location. In one embodiment, the mobile device, the network

component, etc. may operate to identify the location (operation 302) and communicate information with the mobile device based on the location (operation 304). Thus, for example, a computer program product having code, which when executed by a processor, performs operations 302-304 ***may be resident on the mobile device, the network component, etc.*** (*Id.* at [0047] (p. 9) (emphasis added)).

47. Figure 4 of the '197 Application (reproduced below), and the corresponding text at paragraphs [0049]-[0059] (pp. 10-13), is not included in the '584 Provisional. The specification of the '197 Application describes Figure 4 as “illustrat[ing] a method 400 providing a relevancy based trigger for a mobile device.” *Id.* at para [0049] (p. 10).

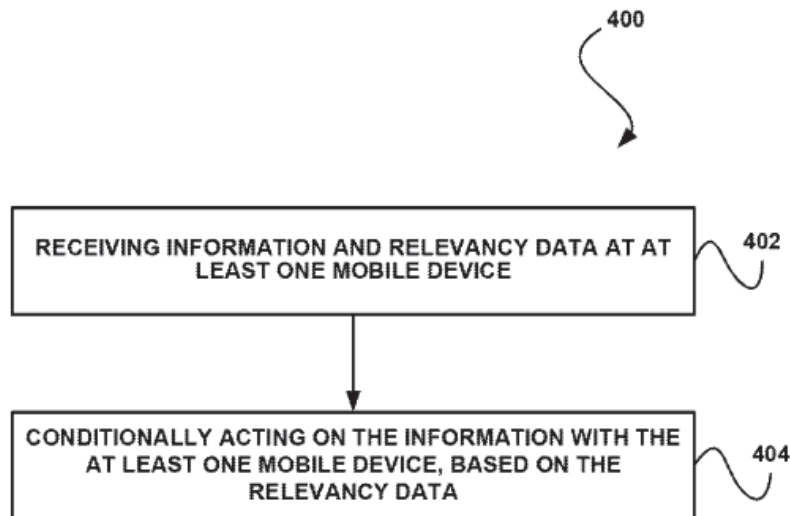


FIGURE 4

48. In describing Figure 4, the specification of the '197 Application states, in part:

[T]he information and relevancy data may be received from ***any device and/or network component***. (*Id.* at [0051] (p. 10) (emphasis added)).

Of course, however, the information may be received via ***any type of communication*** (e.g. ***any*** protocol, etc.). (*Id.* at [0052] (p. 11) (emphasis added)).

Additionally, the information that is received at the one mobile device may be ***any type of information*** capable of being communicated between the mobile devices. For example, the information may be content, such as an advertisement, coupon, digital media, a message, etc. (*Id.* at [0053] (p. 11) (emphasis added)).

As shown in operation 404, the information is conditionally acted upon with the at least one mobile device, based on the relevancy data. In the context of the present description, such action may include displaying, communicating (e.g. sending and/or receiving, etc.), storing, and/or ***any other act capable of being carried out, at least in part, by a mobile device***. In the case of displaying, such display of the information may be accomplished using a graphical user interface presenting the information on a display screen of the mobile device, for example. In this way, the display may allow a user of the mobile device to view the information. (*Id.* at [0054] (p. 11) (emphasis added)).

As noted above, the action on the information is conditional based on the relevancy data. Such relevancy data may include ***any data*** that is related to relevancy of the information with respect to one or more mobile devices and/or users. For instance, such relevancy may be with respect to ***any criteria*** (e.g. aspect such as location, service, etc.) associated with the mobile device or user thereof. For example, only information determined to be relevant may be displayed with the mobile device receiving such information. (*Id.* at [0055] (pp. 11-12) (emphasis added)).

While various examples of criteria that may be used for determining the relevancy of the information are described above, it should be noted that the criteria may be used in ***any desired manner*** to determine the relevancy of the information. (*Id.* at [0058] (p. 12) (emphasis added)).

49. Figures 16 and 18 of the '197 Application (reproduced below), and the corresponding text at paragraphs [0089]-[0099] (pp. 38-41) and [00110]-[00112] (pp. 43-44), are also not included in the '584 Provisional. The specification of the '197 Application describes Figure 16 as “illustrat[ing] an attribute interface 1600.” *Id.* at para [0089] (p. 38).

FIGURE 16

50. In describing Figure 16, the specification of the '197 Application states, in part:

The attribute interface 1600 allows a user to configure location attributes (*and/or any other attributes*, for that matter). For example, a *data/content provider may configure* the location attributes for associating the same with a message (e.g. including the location attributes in a header of the message, etc.), such that a location to which the message is relevant may be specified. As another example, a *data/content distributor may configure* the location attributes for defining the locations of mobile devices from which information is to be gathered. (*Id.* at [0090] (p. 38) (emphasis added)).

The attribute interface 1600 may also allow a user to activate and configure service attributes, such as profiles associated with *mobile devices/associated users* from which information is collected and/or profiles associated with the mobile devices associated users to which information is distributed. The profiles may include demographic information, preference information, any of those shown in the attribute interface 1600 (or others that are not shown). As further shown in the attribute interface 1600, *any* location-based collection action may be further refined by selecting an option to define additional attributes (e.g. via user configuration and/or selection of predetermined attributes including, but not limited to the non-limiting examples described in connection with Figures 7-11, etc.). (*Id.* at [0094] (p. 39) (emphasis added)).

As an additional option, the attribute interface 1600 may provide for selection/configuration of location-based actions in *any desired manner* [e.g. in response to a selection of an activate option (as shown)]. (*Id.* at [0095] (p. 40) (emphasis added)).

It should be noted that, in various embodiments, *any* of the location/service attributes and/or parameters disclosed herein (e.g. see non-limiting examples described in connection with Figures 7-11, etc.) may be used in connection with the attribute interface 1600 as selectable/configurable attributes in the context of any of the examples set forth hereinabove (or others). Further, it should be noted that the *attribute interface 1600 (and any other interfaces disclosed herein) may be implemented in any desired manner* including, but not limited to web-based interfaces, client application interfaces, etc. (*Id.* at [0097] (p. 40) (emphasis added)).

Of course, the attribute interface 1600 may be a component of *any desired framework* where location/service-based message delivery/collection/display is desired. (*Id.* at [0099] (p. 41) (emphasis added)).

51. The specification of the '197 Application describes Figure 18 as “illustrat[ing] various user information delivery interfaces 1800.” *Id.* at para [00110] (p. 43).

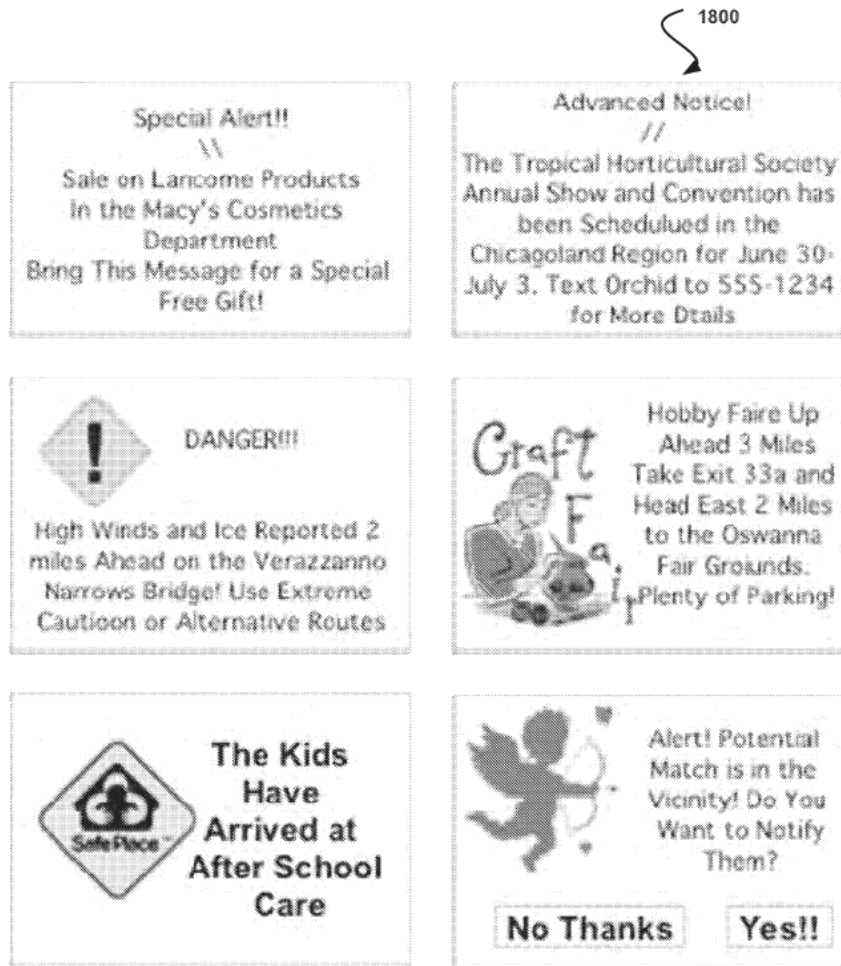


FIGURE 18

52. In describing Figure 18, the specification of the '197 Application states, in part:

The user information delivery interfaces 1800 shown are examples of the messages that may be delivered to device devices[*sic*] by data/content providers. For example, the messages may include location based information which is only distributed to mobile devices associated with a relevant location and/or additional relevancy attributes. (*Id.* at [00111] (p. 44)).

As shown in Figure 18, a notification of a store sale may be delivered to a target audience who are most likely to be interested in such sale and/or have an ability to access the store. Further, event information may be delivered to users who are most likely to be interested in attending the same and/or have a capability of doing so. Even still, an emergency alert may be sent to users who are most likely to be affected by an emergency or dangerous condition. Even still, users may be presented with messages including advertisements (and/or other inquiries, surveys, etc.) that allow for feedback in the form of a response (e.g. "No Thanks,"

"Yes," "Like," etc.). As an option, such feedback may be considered an "attribute" for use in subsequent data collection/delivery/display, etc. (*Id.* at [00112] (p. 44)).

53. Based on these and other repeated statements in the specification, the '197 Application describes that the following are also *not* part of the invention:

- the network architecture (*see, e.g., id.* at [0025] (p. 5) (“the network 102 may take *any form*”))
 - the protocol, platform, and network for enabling communications between data/content provider and mobile device (*see, e.g., id.* at [0063] (p. 14), [0065] (p. 14), [0001] (pp. 14-15), [0006] (p. 16))
- the type of mobile device (*see, e.g., id.* at [0026] (p. 5), Figure 1, [0038] (pp. 7-8), [00120] (p. 46) (“servers and/or clients may each include . . . *any other type of logic*”))
 - any components of such device including primary/secondary memory type and computer readable type (*see, e.g., id.* at [0029] (pp. 5-6), [0030] (p. 6), [0001] (p. 15))
 - communication capabilities of such device (*see, e.g., id.* at [0038] (pp. 7-8) (“the mobile device . . . may be *any device* with mobile communication capabilities”), [0052] (p. 11))
- the number of mobile devices performing a method (*see, e.g., id.* at [0038] (p. 8) (“while only one mobile device is referenced below, the present method 300 may be used with respect to a plurality of mobile devices”), [0048] (p. 27), [0055] (pp. 11-12))
- type of network I/O device (*see, e.g., id.* at [0005] (p. 16), [00120] (p. 46))
- location type, manner of identifying location, and type of device which identifies location (*see, e.g., id.* at [0032] (p. 6) (“such location may include *any* location and may be identified in *any desired manner*”), [0035] (p. 7), [0037] (p. 7))
- associating location identifying device with mobile device (*see, e.g., id.* at [0037] (p. 7), [0087] (p. 37))
- type of non-location based (relevancy-based) factor for triggering sending of information to mobile device (*see, e.g., id.* at [0046] (p. 9) (“the information may be communicated . . . based on . . . *any other* parameter, data, etc. capable of being a basis for the communication of the information”))
- type of information communicated to mobile device based on location or relevancy data (*see, e.g., id.* at [0039] (p. 8) (“the information may be *any type* of information capable of being communicated”), [0053] (p. 11), [0016] (p. 19), [00103] (p. 42))

- manner (and protocol) in which information is communicated to mobile device based on location or relevancy data (*see, e.g., id.* at [0040] (p. 8), [0045] (p. 9), [0052] (p. 11) (“the information may be received via *any* type of communication (e.g. *any* protocol, etc.)”, [00120] (p. 46))
 - triggering mechanism for communication of information (*see, e.g., id.* at [0068] (p. 32), [0078] (p. 35))
- device/network component which sends triggering relevancy data to mobile device (*see, e.g., id.* at [0051] (p. 10) (“information and relevancy data may be received from *any device and/or network component*”), [00120] (p. 46))
- type of action carried out by mobile device based on location or relevancy data (*see, e.g., id.* at [0054] (p. 11) (“such action may include . . . and/or *any other act* capable of being carried out, *at least in part*, by a mobile device”))
- criteria used for determining the relevancy of information communicated to mobile device (*see, e.g., id.* at [0058] (p. 12) (“criteria may be used in *any desired manner* to determine the relevancy of the information”))
- technique for implementing headers (service, location) in messages (*see, e.g., id.* at [0017] (p. 19), [0056] (pp. 28-29))
 - type of location identified by location header (*see, e.g., id.* at [0021] (p. 20) (“location headers may identify *any* desired locations”))
 - data format used to encode location type (*see, e.g., id.* at [0026] (p. 21))
 - information in location/service attributes (*see, e.g., id.* at [0041] (p. 25), [0048] (p. 27), [0055] (p. 28))
 - portion of message based on location/service attributes (*see, e.g., id.* at [0069] (p. 33) (“*any* other aspect of the message . . . may be based on the location/service attributes and/or parameters”))
- manner in which any interface (including attribute interface and user information delivery interface) is implemented (*see, e.g., id.* at [0097] (p. 40) (“attribute interface 1600 (and *any* other interfaces disclosed herein) may be implemented in *any desired manner*”))

54. Specifically related to the disputed claim limitations of the Asserted Claims, the ’197 Application did not use the word “computer code”, but used the words “code” and “application” interchangeably, and described “code” and “logic” as performing identical functions. *See, e.g., id.* at [0047] (p. 9); [0041]-[0043] (pp. 25-26); [0060]-[0061] (p. 30); [0093] (p. 39);

[0097] (p. 40); [00121] (p. 46); claim 1 (p. 48) (“code for identifying a location; and code for communicating information with at least one mobile device, based on the location.”); claim 14 (p. 49) (“logic for identifying a location; and logic for communicating information with the at least one mobile device, based on the location.”).

3. “application” / “computer code” / “code” “. . . cause display of an option”

55. My opinions in this section are relevant to the following claim terms³:

- “an application configured for execution by at least one of a plurality of mobile devices . . . the application when executed **causes the at least one mobile device to . . . display of an option via a display of the at least one mobile device**” (’899 Patent, claim 1)
- “an application configured for execution by at least one of a plurality of mobile devices . . . the application, when executed, configured to **cause display of an option via a display of the at least one mobile device**” (’899 Patent, claim 11)
- “computer code configured for execution by at least one of a plurality of mobile devices . . . the computer code, when executed, configured to . . . **cause display of an option via a display of the at least one mobile device**” (’899 Patent, claims 7, 9)
- “code configured to be executed by at least one of the plurality of mobile devices, the code, when executed, configured to . . . **cause display, via a display of the at least one mobile device, of an option for causing first visual information and second visual information to be output via the at least one mobile device**” (’292 Patent, claims 1, 15, 28)

56. The claims state that a function of the “code” (or “computer code” or “application”), which is “configured for execution by at least one of a plurality of mobile devices” is to “cause display of an option via a display of the at least one mobile device” and where, for claims 1, 15 and 28 of the ’292 Patent, the “option” is “for causing first visual information and second visual information to be output via the at least one mobile device.” I am not aware of any dispute between the parties as to this function of the “code” (or “computer code” or “application”).

³ Counsel has informed me of Defendant’s identified functions in these claim phrases, which I respectively highlight in bold below. In this report, I include similar bold highlighting in each claim phrase for which I have rendered an opinion.

In my opinion, the functionality recited in each of these limitations is not something that a general purpose computer could perform without special purpose programming.

57. Upon review, I have concluded that the claim language does not connote definite structure for performing the identified function to a POSITA. The claims of the Asserted Patents use the terms “code”, “computer code” and “application” interchangeably. *See* paragraph 55 above, paragraphs 67, 80 below; ’899 Patent at claims 1, 7, 9, 11; ’292 Patent at claims 1, 15, 28. The surrounding claim language specifies that such “code” is “configured for execution by” a “mobile device” with a “display”; however, such language does not identify any specific structure of “code” to perform the recited function of “*caus[ing]* display of *an option* via” such display. Rather, the “code” is defined in the claims, not by specific recited programming or a specific recited algorithm, but only by this recited function.

58. At Dyfan’s contended time of the invention (March 2011), the ’584 Provisional did not use the words “code”, “computer code”, or “option” as recited in the claims. *See* paragraph 40 above. And the ’197 Application did not use the word “computer code”, but used the words “code” and “application” interchangeably, and described “code” and “logic” as performing identical functions. *See* paragraph 54 above. In my opinion, none of the Asserted Claims (*see* paragraph 55 above) recite the particular algorithm that performs this particular recited function.

59. Thus, based on my opinion and instructions from counsel regarding the applicable law, this claim phrase is subject to 35 U.S.C. 112, ¶ 6.

60. It is additionally my opinion that the ’584 Provisional does not disclose any specific algorithm that is clearly linked to “caus[ing] display of an option via a display” of “at least one of a plurality of mobile devices.” The ’584 Provisional does disclose, in connection with the corresponding portion of Figure 12, “[a]t step 1590, Mobile Terminal (700) performs actions based

on Message Payload (1400), or Header Data (1200, 1300)” in the “message broadcast from, or sent by, Network I/O Unit (420, 520, 620).” *See* paragraph 37 above. The ’584 Provisional also discloses, “Such actions may include, singly, collectively, and in any order”:

- “[s]tep 1591a: Display of certain elements of the message content in the form of text, images or video”,
- “[s]tep 1591c: Production of other types of user interface signals usable by the mobile terminal or its peripheral devices or interfaces”,
- “[s]tep 1591e: Control of one or more terminal application functions based on the information in the content headers (1100, 1200, 1300)” including “[f]or example . . . [h]olding the message until some other criteria is met . . . and then talking[*sic*] one or more of the actions described in steps 1591a through 1591d, etc.” (*see* 1591a, 1591c above), and
- “comparison of the message header information and or message content information to stored user preferences to determine the appropriate actions, which may include no action.” *See* paragraph 37 above.

61. As a threshold point, the ’584 Provisional did not use the word “option” as recited in the claims, much less disclose any structure clearly linked to causing the display of such an option. *See* paragraphs 40, 58 above. Additionally, the Asserted Claims are not limited to the examples disclosed in the ’584 Provisional, for example, displaying content in the message payload or header data of the “one or more messages” that the displaying-mobile device receives from the “at least one broadcast short range communication unit.” And, while this aforementioned portion of Figure 12 might qualify as a “flowchart,” it states only high level results of undisclosed programming steps, none of which include a sufficiently precise description of the structure linked to perform the function of “*caus[ing]* display of *an option* via a display” of “at least one of a plurality of mobile devices.” As such, in my opinion, the ’584 Provisional does not disclose any specific algorithm, in any form, that is clearly linked to performing the recited function.

62. To the extent that Dyfan contends that the invention date of the Asserted Claims is the filing date of the ’197 Application rather the filing date of the ’584 Provisional, it is also my opinion that the specification of the ’197 Application does not disclose any specific algorithm that

is clearly linked to “caus[ing] display of an option via a display” of “at least one of a plurality of mobile devices”. Rather, the specification of the ’197 Application itself confirms that any subject matter added to the ’584 Provisional is generic and void of structure.

63. For example, the specification of the ’197 Application describes that the “location based trigger for a mobile device” of Figure 3 generically involves identifying location (step 302) “in any desired manner”, and, based on the identified location, using “any type of communication” to communicate “any type of information capable of being communicated” with “any device with mobile communication capabilities” (step 304). *See* paragraphs 45-46 above.

64. Likewise, the specification describes that the “relevancy based trigger for a mobile device” of Figure 4 generically involves receiving, “from any device and/or network component” via “any type of communication”, “any type of information” and “any data that is related to relevancy of [such] information”, where “such relevancy may be with respect to any criteria . . . associated with the mobile device or user” and “the criteria may be used in any desired manner to determine the relevancy of the information”, (step 402), and, based on such data, performing “any other act capable of being carried out, at least in part, by a mobile device” (step 404). *See* paragraphs 47-48 above.

65. Additionally, for example, the specification of the ’197 Application provides a laundry list of user interfaces for “attribute interface” of Figure 16 and “user information delivery interface” of Figure 18, and also generically describes such interfaces including that they “may be implemented in any desired manner” and “may be a component of any desired framework.” *See* paragraphs 49-52 above. Moreover, the specification generically describes that all of the methods, systems, and interfaces (depicted in Figures 2-20) “may be carried out in any desired environment” and describes “every feature disclosed herein” as “optional.” *See* paragraphs 42-44 above.

66. While the examples in the '584 Provisional (*see* paragraphs 37, 60-61 above) and in the '197 Application (*see* paragraphs 45-52 above) might enable a POSITA to develop “code” configured to “cause display of an option via a display” of “at least one of a plurality of mobile devices”, I understand that this is not the test as to whether the '197 Application specification discloses an algorithm for programming a general purpose computer or microprocessor to perform the particular claimed function. In my opinion, the specification of the '197 Application does not disclose any specific algorithm, in any form, that is clearly linked to performing this particular recited function.

4. *“application” / “computer code” / “code” “. . . receive an indication of a receipt . . . of the one or more messages”*

67. My opinions in this section are relevant to the following claim terms:

- “an application configured for execution by [configured to be executed by] at least one of a plurality of mobile devices . . . the application when executed causes the at least one mobile device to [configured to] . . . **receive an indication of a receipt, without solicitation from the at least one broadcast short-range communications unit and via the Bluetooth [first] wireless communications protocol, of the one or more messages including the address portion and the identifier including the at least three fields and the at least one value**” ('899 Patent, claims 1, 11)
- “computer code configured for execution by at least one of a plurality of mobile devices . . . the computer code, when executed, configured to . . . **receive an indication of a receipt, without solicitation from the at least one broadcast short-range communications unit and via the short-range first wireless communications protocol, of the one or more messages including the address portion, the [at least three/plurality of] fields, and the at least one value**” ('899 Patent, claims 7, 9, 11)
- “code configured for execution by at least one of a plurality of mobile devices . . . the code, when executed, configured to . . . **receive an indication of a receipt from the first broadcast short-range communications unit and via the first wireless communications protocol, of the one or more first broadcast messages including the at least one first value**” ('292 Patent, claims 1, 15, 28)
- “code configured to be executed by at least one of the plurality of mobile devices, the code, when executed, configured to . . . **receive an indication of a receipt, from the second broadcast short-range communications unit and via the first**

wireless communications protocol, of the one or more second broadcast messages including the at least one second value” (’292 Patent, claims 1, 15, 28)

68. The claims state that a function of the “code” (or “computer code” or “application”), which is “configured for execution by at least one of a plurality of mobile devices” is to “receive an indication of a receipt of the one or more messages including [different portions, values, fields, etc.].” I am not aware of any dispute between the parties as to this function of the “code” (or “computer code” or “application”). In my opinion, the functionality recited in each of these limitations is not something that a general purpose computer could perform without special purpose programming.

69. Upon review, I have concluded that the claim language does not connote definite structure for performing the identified function to a POSITA. The claims of the Asserted Patents use the terms “code”, “computer code” and “application” interchangeably. *See* paragraphs 55, 67 above, paragraph 80 below; ’899 Patent at claims 1, 7, 9, 11; ’292 Patent at claims 1, 15, 28. The surrounding claim language specifies that such “code” is “configured for execution by” a “mobile device”, and that such mobile device receives the “one or more messages” “without solicitation from the [broadcast short-range communications unit] and via the [Bluetooth / short range / first / second] wireless communications protocol.” However, such language does not identify any specific structure of “code” to perform the recited function of “receiv[ing] *an indication of a receipt*” of such messages. Rather, the “code” is defined in the claims, not by specific recited programming or a specific recited algorithm, but only by this recited function.

70. At Dyfan’s contended time of the invention (March 2011), the ’584 Provisional did not use the words “code”, “computer code”, or “indication” as recited in the claims. *See* paragraph 40 above. And the ’197 Application did not use the word “computer code”, but used the words “code” and “application” interchangeably, and described “code” and “logic” as performing

identical functions. *See* paragraph 54 above. In my opinion, none of these Asserted Claims (*see* paragraph 67 above) recite the particular algorithm that performs this particular recited function.

71. Thus, based on my opinion and instructions from counsel regarding the applicable law, this claim phrase is subject to 35 U.S.C. 112, ¶ 6.

72. It is additionally my opinion that the '584 Provisional does not disclose any specific algorithm that is clearly linked to “receiv[ing] an indication of a receipt . . . of the one or more messages.”

73. The '584 Provisional does disclose, regarding Figure 12, “[a]t step 1590, Mobile Terminal (700) performs actions based on Message Payload (1400), or Header Data (1200, 1300)” in the “message broadcast from, or sent by, Network I/O Unit (420, 520, 620).” *See* paragraph 37 above. The '584 Provisional also discloses, “Such actions may include, singly, collectively, and in any order”: “[s]tep 1591a: Display of certain elements of the message content in the form of text, images or video . . . [s]tep 1591c: Production of other types of user interface signals usable by the mobile terminal or its peripheral devices or interfaces.” *See* paragraph 37 above.

74. The '584 Provisional also discloses, regarding Figure 14:

- “[a]t step 1730, Mobile Terminal (700) compares Header (1100, 1200, 1300), and/or Message Payload (1400), to a list of cancelled rebroadcast messages received at some earlier time; If the Message (1000) has been cancelled, Mobile Terminal (700) deletes the received message, and returns to step 1700; If not, then it proceeds to step 1740”
- “[a]t step 1750, Mobile Terminal (700) compares message headers (1100, 1200, 1300), and/or message payload (1400) to any messages received since the subject message was received, if no received messages are the same as the subject message, then the mobile Terminal (700) proceeds to step 1760. If the subject message has been subsequently received after its initial reception, the Mobile Terminal (700) returns to Step 1730.” *See* paragraph 39 above.

75. As a threshold point, the '584 Provisional did not use the word “indicate” or “indication” as recited in the claims, much less disclose any structure clearly linked to receiving

such an “indication” of a receipt of the recited one or more messages. *See* paragraphs 40, 70 above. Additionally, the Asserted Claims are not limited to the examples disclosed in the ’584 Provisional, for example, displaying content in the message payload or header data of the “one or more messages”, or comparing such content to previously or subsequently received messages, that the mobile device receives from the “at least one broadcast short range communication unit.” And, while these portions of Figure 12 and 14 might each qualify as a “flowchart,” each state only high level results of undisclosed programming steps, none of which include a sufficiently precise description of the structure linked to perform the function of “receiv[ing] *an indication of a receipt . . . of the one or more messages.*” As such, in my opinion, the ’584 Provisional does not disclose any specific algorithm, in any form, that is clearly linked to performing the recited function.

76. To the extent that Dyfan contends that the invention date of the Asserted Claims is the filing date of the ’197 Application (rather the filing date of the ’584 Provisional), it is also my opinion that the specification of the ’197 Application does not disclose any specific algorithm that is clearly linked to “receiv[ing] an indication of a receipt . . . of the one or more messages.” Rather, the specification of the ’197 Application itself confirms that any subject matter added to the ’584 Provisional is generic and void of structure.

77. For example, the specification of the ’197 Application discloses that the “service header 1000” in a “message structure 700” may include one or more “service attributes 1002” including, for example:

service attributes may indicate criteria that is relevant to a receipt/display of, interaction with, etc. a particular message(s) and/or previous message(s). Just by way of example, the service attributes may indicate that a new message is to be distributed to only those locations/devices/persons that were in receipt of a previous message. (’197 Application at para [0047] (p. 27)). :

78. The specification of the ’197 Application generically describes that “message structure 700”, and “service header 1000”, “may be implemented in any desired environment”,

that “any location/service attributes and/or parameters may be used in connection with the foregoing operations”, and that “content of a message” and “any other aspect of the message . . . may be based on the location/service attributes and/or parameters.” *See* paragraphs 42, 53 above; ’197 Application at [0055] (p. 28), [0069] (p. 33). As I also identified above, the specification of the ’197 Application generically describes “attribute interface” of Figure 16 and “user information delivery interface” of Figure 18, including that they “may be implemented in any desired manner” and “may be a component of any desired framework.” *See* paragraphs 49-52 above. Moreover, the specification generically describes “every feature disclosed herein” as “optional.” *See* paragraph 44 above.

79. Thus, in my opinion, while these examples in the ’584 Provisional (*see* paragraphs 37, 39, and 72-75 above) and in the ’197 Application (*see* paragraphs 51-52 and 77-78 above) might enable a POSITA to develop “code” configured to “receive an indication of a receipt . . . of the one or more messages,” I understand that this is not the test as to whether the ’197 Application specification discloses an algorithm for programming a general purpose computer or microprocessor to perform this particular claimed function. In my opinion, the specification of the ’197 Application does not disclose any specific algorithm, in any form, that is clearly linked to performing this particular recited function.

5. “application” / “computer code” / “code” “. . . causing to be output, via the at least one mobile device, the visual information based on the particular location-relevant information”

80. My opinions in this section are relevant to the following claim terms:

- “said application, when executed, further configured to cause the at least one mobile device to . . . **in response to the receipt**, from the at least one server and via the another wireless communications protocol, **of the response message including the particular location-relevant information; control**, utilizing the application, **the one or more mobile device application actions of the application including causing to be output, via the at least one mobile device,**

- the mobile device application visual information based on the particular location-relevant information”** (’899 Patent, claim 1)
- **“said application, when executed, further configured to . . . after the receipt, from the at least one server and via the second wireless communications protocol, of the response message including the particular location-relevant information: cause, utilizing the application, the one or more mobile device application actions including causing to be output, via the at least one mobile device, the visual information based on the particular location-relevant information”** (’899 Patent, claim 11)
 - **“computer code, when executed, further configured to . . . in response to [after] the receipt, from the at least one server and via the second wireless communications protocol, of the response message including the particular location-relevant information from the at least one server and via the second wireless communications protocol; cause, utilizing the computer code, the one or more mobile device actions including causing to be output, via the at least one mobile device, the visual information based on the particular location-relevant information”** (’899 Patent, claims 7, 9)
 - **“code, when executed, further configured to . . . after the receipt, from the at least one server and via the second wireless communications protocol, of the response message including the first location-relevant information and the second location-relevant information: cause to be output, via the at least one mobile device, the first visual information based on the first location-relevant information”** (’292 Patent, claim 1)
 - **“said code, when executed, further configured to . . . in response to the receipt, from the at least one server and via the second wireless communications protocol and the Internet Protocol over the Internet at least in part, of the first response message including the first location-relevant information [of the first location-relevant information]: cause to be output, via the at least one mobile device, the first visual information based on the first location-relevant information”** (’292 Patent, claims 15, 28)

81. The claims state that a function of the “code” (or “computer code” or “application”), which is “configured for execution by at least one of a plurality of mobile devices” is to “[in response to /after] the receipt of the response message including the particular location-relevant information . . . cause to be output, via the at least one mobile device, the visual information based on the particular location-relevant information.” I am not aware of any dispute between the parties as to this function of the “code” (or “computer code” or “application”). In my

opinion, the functionality recited in each of these limitations is not something that a general purpose computer could perform without special purpose programming.

82. Upon review, I have concluded that the claim language does not connote definite structure for performing the identified function to a POSITA. The claims of the Asserted Patents use the terms “code”, “computer code” and “application” interchangeably. *See* paragraph 80 above; ’899 Patent at claims 1, 7, 9, 11; ’292 Patent at claims 1, 15, 28. The surrounding claim language specifies that such “code” is “configured for execution by” a “mobile device”, that the “response message” is received “from the at least one server and via [the another/second] wireless communications protocol [and the Internet Protocol over the Internet at least in part]”, and that the “[the another/second] wireless communications protocol” is different than the “[Bluetooth/short-range/first] wireless communications protocol” via which the mobile device receives “the one or more messages” from the “broadcast short-range communication unit”.

83. The surrounding claim language in the ’899 Patent claims also specifies that “the visual information is based on the particular location-relevant information that is, in turn, based on the at least one value”, where the mobile device receives “the at least one value” from the “broadcast short-range communication unit” and sends “the at least one value” to “the at least one server”, and where the “the at least one server” [locates/retrieves] “the particular location relevant information” “in response to” receiving “the at least one value” from the mobile device. The surrounding claim language in the ’292 Patent claims also specifies that the mobile device sends “at least one message” to “the at least one server”, where “the at least one message” does not pass through either “the first broadcast short-range communication unit” nor “the second broadcast short-range communication unit”, and where the “the at least one server” retrieves both the “first”

and the “second” “location relevant information” “in response to” receiving “the at least one message” from the mobile device

84. Such claim language, however, does not identify any specific structure of “code” to perform the recited function of “[in response to /after] the receipt of the response message including the particular location-relevant information . . . *cause to be output*, via the at least one mobile device, *the visual information based on* the particular location-relevant information.” Rather, the “code” is defined in the claims, not by specific recited programming or a specific recited algorithm, but only by this recited function.

85. At Dyfan’s contended time of the invention (March 2011), the ’584 Provisional did not use the words “code”, “computer code”, “visual information” or “location-relevant information” as recited in the claims. *See* paragraph 40 above. And the ’197 Application did not use the word “computer code” (but used the words “code” and “application” interchangeably, and described “code” and “logic” as performing identical functions), and did not use the words “visual information” or “location-relevant information” as recited in the claims. *See* paragraph 54 above. In my opinion, none of these Asserted Claims (*see* paragraph 80 above) recite the particular algorithm that performs the particular recited function (“[in response to /after] the receipt of the response message including the particular location-relevant information . . . cause to be output, via the at least one mobile device, the visual information based on the particular location-relevant information”).

86. Thus, based on my opinion and instructions from counsel regarding the applicable law, this claim phrase is subject to 35 U.S.C. 112, ¶ 6.

87. It is additionally my opinion that the ’584 Provisional does not disclose any specific algorithm that is clearly linked to “[in response to /after] the receipt of the response message

including the particular location-relevant information . . . caus[ing] to be output, via the at least one mobile device, the visual information based on the particular location-relevant information.”

88. The ’584 Provisional does disclose, regarding Figure 12, “[a]t step 1590, Mobile Terminal (700) performs actions based on Message Payload (1400), or Header Data (1200, 1300)” in the “message broadcast from, or sent by, Network I/O Unit (420, 520, 620).” *See* paragraph 37 above. The ’584 Provisional also discloses, “Such actions may include, singly, collectively, and in any order”:

- “[s]tep 1591a: Display of certain elements of the message content in the form of text, images or video”,
- “[s]tep 1591c: Production of other types of user interface signals usable by the mobile terminal or its peripheral devices or interfaces”,
- “[s]tep 1591e: Control of one or more terminal application functions based on the information in the content headers (1100, 1200, 1300)” including “[f]or example . . . [h]olding the message until some other criteria is met . . . and then talking[sic] one or more of the actions described in steps 1591a through 1591d, etc.” (*see* 1591a, 1591c above), and
- “comparison of the message header information and or message content information to stored user preferences to determine the appropriate actions, which may include no action.” *See* paragraph 37 above.

89. The Asserted Claims specifically require “***causing to be output***, via the at least one mobile device, ***the visual information based on*** the particular location relevant information” (*i.e.*, based on the information received in the “response message” from “the at least one server”). While this portion of Figure 12 might qualify as a “flowchart,” it states only high level results of undisclosed programming steps, none of which include a sufficiently precise description of the structure linked to perform the function of “***causing to be output***, via the at least one mobile device, ***the visual information based on*** the particular location relevant information” (*i.e.*, based on the information received in the “response message” from “the at least one server”). As such, in my opinion, the ’584 Provisional does not disclose any specific algorithm, in any form, that is clearly linked to performing this recited function.

90. To the extent that Dyfan contends that the invention date of the Asserted Claims is the filing date of the '197 Application rather the filing date of the '584 Provisional, it is also my opinion that the specification of the '197 Application does not disclose any specific algorithm that is clearly linked to “[in response to /after] the receipt of the response message including the particular location-relevant information . . . caus[ing] to be output, via the at least one mobile device, the visual information based on the particular location-relevant information.” Rather, the specification of the '197 Application itself confirms that any subject matter added to the '584 Provisional is generic and void of structure.

91. For example, the specification of the '197 Application describes that the “location based trigger for a mobile device” of Figure 3 generically involves identifying location (step 302) “in any desired manner”, and, based on the identified location, using “any type of communication” to communicate “any type of information capable of being communicated” with “any device with mobile communication capabilities” (step 304). *See* paragraphs 45-46 above. Likewise, the specification describes that the “relevancy based trigger for a mobile device” of Figure 4 generically involves receiving, “from any device and/or network component” via “any type of communication”, “any type of information” and “any data that is related to relevancy of [such] information”, where “such relevancy may be with respect to any criteria . . . associated with the mobile device or user” and “the criteria may be used in any desired manner to determine the relevancy of the information”, (step 402), and, based on such data, performing “any other act capable of being carried out, at least in part, by a mobile device” (step 404). *See* paragraphs 47-48 above. Moreover, the specification generically describes that all of the methods, systems, and interfaces (depicted in Figures 2-20) “may be carried out in any desired environment” and describes “every feature disclosed herein” as “optional.” *See* paragraphs 42-44 above.

92. While the examples in the '584 Provisional (*see* paragraphs 37 and 87-89 above) and in the '197 Application (*see* paragraphs 45-48 and 90-92 above) might enable a POSITA to develop “code” configured to perform this specific recited function, I understand that this is not the test as to whether the '197 Application specification discloses an algorithm for programming a general purpose computer or microprocessor to perform this particular function. In my opinion, the specification of the '197 Application does not disclose any specific algorithm, in any form, that is clearly linked to “[in response to /after] the receipt of the response message including the particular location-relevant information . . . *caus[ing] to be output*, via the at least one mobile device, *the visual information based on* the particular location-relevant information.”

6. “code” “. . . cause to be output, via the at least one mobile device, the second visual information based on the second location-relevant information”

93. My opinions in this section are relevant to the following claim terms:

- “said code, when executed, further configured to . . . **after the receipt**, from the at least one server and via the second wireless communications protocol, **of the response message including the first location-relevant information and the second location-relevant information; after the first visual information is caused to be output based on the first location-relevant information; and after the at least one mobile device is moved in the building: cause to be output, via the at least one mobile device, the second visual information based on the second location-relevant information**” ('292 Patent, claim 1)
- “said code, when executed, further configured to . . . **after the first visual information is caused to be output based on the first location-relevant information; after the at least one mobile device is moved in the building; and in response to the receipt**, from the at least one server and via the second wireless communications protocol, **of the second response message including the second location-relevant information: cause to be output, via the at least one mobile device, the second visual information based on the second location-relevant information**” ('292 Patent, claim 15)
- “said code, when executed, further configured to . . . **after the receipt**, from the at least one server and via the second wireless communications protocol, **of the second location-relevant information; after the first visual information is caused to be output based on the first location-relevant information; and after the at least one mobile device is moved in the building: cause to be**

output, via the at least one mobile device, the second visual information based on the second location-relevant information” (’292 Patent, claim 28)

94. The claims state that a function of the “code,” which is “configured for execution by at least one of a plurality of mobile devices” is to “cause to be output, via the at least one mobile device, the second visual information based on the second location-relevant information” (1) “[in response to /after] the receipt of the response message including the second location-relevant information”, (2) “after the first visual information is caused to be output based on the first location-relevant information,” and (3) “after the at least one mobile device is moved in the building.” I am not aware of any dispute between the parties as to this function of the “code.” In my opinion, the functionality recited in each of these limitations is not something that a general purpose computer could perform without special purpose programming.

95. Upon review, I have concluded that the claim language does not connote definite structure for performing this identified function to a POSITA. The claims of the Asserted Patents use the terms “code”, “computer code” and “application” interchangeably. *See* paragraphs 55, 67, 80 above; ’292 Patent at claims 1, 15, 28. The surrounding claim language specifies that such “code” is “configured for execution by” a “mobile device”, that the “second location-relevant information” is received “from the at least one server and via the second wireless communications protocol” (whether in the same or different “response messages” as the “first location-relevant information”).

96. The surrounding claim language also specifies that the mobile device sends “at least one message” to “the at least one server”, where “the at least one message” does not pass through either “the first broadcast short-range communication unit” nor “the second broadcast short-range communication unit”, and where the “the at least one server” retrieves both the “first” and the “second” “location relevant information” “in response to” receiving “the at least one message”

from the mobile device. The surrounding claim language also specifies that “the first wireless communications protocol” (via which the mobile device respectively receives the first and second “values” from the first and second “broadcast short-range communication units”) is both “different” and has a shorter range than the “the second wireless communications protocol” (via which the mobile device sends and receives messages with the “at least one server”).

97. Such claim language, however, does not identify any specific structure of “code” to perform the recited function of “*cause to be output*, via the at least one mobile device, *the second visual information based on* the second location-relevant information” (1) “[in response to /after] the receipt of the response message including the second location-relevant information”, (2) “*after the first visual information is caused to be output based on the first location-relevant information,*” and (3) “*after the at least one mobile device is moved in the building.*” Rather, the “code” is defined in the claims, not by specific recited programming or a specific recited algorithm, but only by this recited function.

98. At Dyfan’s contended time of the invention (March 2011), the ’584 Provisional did not use the words “code”, “computer code”, “visual information” or “location relevant information” as recited in the claims. *See* paragraph 40 above. And the ’197 Application did not use the word “computer code” (but used the words “code” and “application” interchangeably, and described “code” and “logic” as performing identical functions), and did not use the words “visual information” or “location relevant information” as recited in the claims. *See* paragraph 54 above. In my opinion, none of these Asserted Claims (*see* paragraph 93 above) recite the particular algorithm that performs this particular recited function (“cause to be output, via the at least one mobile device, the second visual information based on the second location-relevant information” (1) “[in response to /after] the receipt of the response message including the second location-

relevant information”, (2) “after the first visual information is caused to be output based on the first location-relevant information,” and (3) “after the at least one mobile device is moved in the building”).

99. Thus, based on my opinion and instructions from counsel regarding the applicable law, this claim phrase is subject to 35 U.S.C. 112, ¶ 6.

100. It is additionally my opinion that the ’584 Provisional does not disclose any specific algorithm that is clearly linked to “caus[ing] to be output, via the at least one mobile device, the second visual information based on the second location-relevant information” (1) “[in response to /after] the receipt of the response message including the second location-relevant information”, (2) “after the first visual information is caused to be output based on the first location-relevant information,” and (3) “after the at least one mobile device is moved in the building.”

101. The ’584 Provisional does disclose “[a]t step 1590, Mobile Terminal (700) performs actions based on Message Payload (1400), or Header Data (1200, 1300)” in the “message broadcast from, or sent by, Network I/O Unit (420, 520, 620).” *See* paragraph 37 above. The ’584 Provisional also discloses, “Such actions may include, singly, collectively, and in any order”:

- “[s]tep 1591a: Display of certain elements of the message content in the form of text, images or video”,
- “[s]tep 1591c: Production of other types of user interface signals usable by the mobile terminal or its peripheral devices or interfaces”,
- “[s]tep 1591e: Control of one or more terminal application functions based on the information in the content headers (1100, 1200, 1300)” including “[f]or example . . . [h]olding the message until some other criteria is met . . . and then talking[*sic*] one or more of the actions described in steps 1591a through 1591d, etc.” (*see* 1591a, 1591c above), and
- “comparison of the message header information and or message content information to stored user preferences to determine the appropriate actions, which may include no action.” *See* paragraph 37 above.

102. The Asserted Claims specifically require “***causing to be out[put]***, via the at least one mobile device, ***the second visual information based on*** the second location-relevant

information” (*i.e.*, based on information that is (1) different from the “first visual information” and (2) received in either the same “response message” from “the at least one server” as the “first visual information” or a different one). The Asserted Claims also specifically require that this function is performed “*after the first visual information is caused to be output based on the first location-relevant information,*” and “*after the at least one mobile device is moved in the building.*” While this portion of Figure 12 might qualify as a “flowchart,” it states only high level results of undisclosed programming steps, none of which include a sufficiently precise description of the structure linked to perform this requisite, recited function. As such, in my opinion, the ’584 Provisional does not disclose any specific algorithm, in any form, that is clearly linked to performing this recited function.

103. To the extent that Dyfan contends that the invention date of the Asserted Claims is the filing date of the ’197 Application rather the filing date of the ’584 Provisional, it is also my opinion that the specification of the ’197 Application does not disclose any specific algorithm that is clearly linked to “caus[ing] to be output, via the at least one mobile device, the second visual information based on the second location-relevant information” (1) “[in response to /after] the receipt of the response message including the second location-relevant information”, (2) “after the first visual information is caused to be output based on the first location-relevant information,” and (3) “after the at least one mobile device is moved in the building.” Rather, the specification of the ’197 Application itself confirms that any subject matter added to the ’584 Provisional is generic and void of structure.

104. For example, the specification of the ’197 Application describes that the “location based trigger for a mobile device” of Figure 3 generically involves identifying location (step 302) “in any desired manner”, and, based on the identified location, using “any type of communication”

to communicate “any type of information capable of being communicated” with “any device with mobile communication capabilities” (step 304). *See* paragraphs 45-46 above. Likewise, the specification describes that the “relevancy based trigger for a mobile device” of Figure 4 generically involves receiving, “from any device and/or network component” via “any type of communication”, “any type of information” and “any data that is related to relevancy of [such] information”, where “such relevancy may be with respect to any criteria . . . associated with the mobile device or user” and “the criteria may be used in any desired manner to determine the relevancy of the information”, (step 402), and, based on such data, performing “any other act capable of being carried out, at least in part, by a mobile device” (step 404). *See* paragraphs 47-48 above. Moreover, the specification generically describes that all of the methods, systems, and interfaces (depicted in Figures 2-20) “may be carried out in any desired environment” and describes “every feature disclosed herein” as “optional.” *See* paragraphs 42-44 above.

105. While the '584 Provisional (*see* paragraphs 37 and 100-102 above) and the examples in the '197 Application (*see* paragraphs 45-48 above) might enable a POSITA to develop “code” configured to perform this specific recited function, I understand that this is not the test as to whether the '197 Application specification discloses an algorithm for programming a general purpose computer or microprocessor to perform this particular function. In my opinion, the specification of the '197 Application does not disclose any specific algorithm, in any form, that is clearly linked to “*caus[ing] to be output*, via the at least one mobile device, *the second visual information based on* the second location-relevant information” (1) “[in response to /after] the receipt of the response message including the second location-relevant information”, (2) “*after the first visual information is caused to be output based on the first location-relevant information,*” and (3) “*after the at least one mobile device is moved in the building.*”

7. *“application” “. . . permit a determination as to whether the one or more mobile device application actions including causing to be output the visual information is triggered”*

106. My opinions in this section are relevant to the following claim terms:

- “said application, when executed, is configured to **permit a determination as to whether the one or more mobile device application actions including causing to be output the visual information is triggered**” (’899 Patent, claim 11)

107. Claim 11 of the ’899 Patent states that a function of the “application”, which is “configured for execution by at least one of a plurality of mobile devices” is to “permit a determination as to whether the one or more mobile device application actions including causing to be output the visual information is triggered.” I am not aware of any dispute between the parties as to this function of the “application.” In my opinion, the functionality recited in this limitation is not something that a general purpose computer could perform without special purpose programming.

108. Upon review, I have concluded that the claim language does not connote definite structure for performing this identified function to a POSITA. The claims of the Asserted Patents use the term “application” interchangeably with the terms “code” and “computer code.” *See* paragraphs 55, 67, 80 above. The surrounding claim language specifies that such “application” is “configured for execution by” a “mobile device”, and that “the one or more mobile device application actions including causing to be output, via the at least one mobile device, the visual information based on the particular location-relevant information” is “caused” “after the receipt . . . of the response message including the particular location-relevant information.” *See also* paragraphs 81, 83 above.

109. Such claim language, however, does not identify any specific structure of “code” to perform the recited function of “*permit a determination as to whether* the one or more mobile device application actions including causing to be output the visual information *is triggered.*”

Rather, the “code” is defined in ’899 Patent claim 11, not by specific recited programming or a specific recited algorithm, but only by this recited function.

110. At Dyfan’s contended time of the invention (March 2011), the ’584 Provisional did not use the words “code”, “computer code”, “visual information” or “permit” as recited in the claims. *See* paragraph 40 above. And the ’197 Application did not use the word “computer code” (but used the words “code” and “application” interchangeably, and described “code” and “logic” as performing identical functions), and did not use the words “visual information” or “permit” as recited in the claims. *See* paragraph 54 above. In my opinion, ’899 Patent claim 11 (*see* paragraph 106 above) does not recite the particular algorithm that performs this particular recited function (“permit a determination as to whether the one or more mobile device application actions including causing to be output the visual information is triggered”).

111. Thus, based on my opinion and instructions from counsel regarding the applicable law, this claim phrase is subject to 35 U.S.C. 112, ¶ 6.

112. It is additionally my opinion that the ’584 Provisional does not disclose any specific algorithm that is clearly linked to “permit a determination as to whether the one or more mobile device application actions including causing to be output the visual information is triggered.”

113. The ’584 Provisional does disclose, regarding Figure 12, “[a]t step 1590, Mobile Terminal (700) performs actions based on Message Payload (1400), or Header Data (1200, 1300)” in the “message broadcast from, or sent by, Network I/O Unit (420, 520, 620).” *See* paragraph 37 above. The ’584 Provisional also discloses, “Such actions may include, singly, collectively, and in any order”:

- “[s]tep 1591a: Display of certain elements of the message content in the form of text, images or video”,
- “[s]tep 1591c: Production of other types of user interface signals usable by the mobile terminal or its peripheral devices or interfaces”,

- “[s]tep 1591e: Control of one or more terminal application functions based on the information in the content headers (1100, 1200, 1300)” including “[f]or example . . . [h]olding the message until some other criteria is met . . . and then talking[sic] one or more of the actions described in steps 1591a through 1591d, etc.” (see 1591a, 1591c above), and
- “comparison of the message header information and or message content information to stored user preferences to determine the appropriate actions, which may include no action.” See paragraph 37 above.

114. While this portion of Figure 12 might qualify as a “flowchart,” and while it discloses various “actions” performed by a “mobile terminal”, it states only high level results of undisclosed programming steps, none of which include a sufficiently precise description of the structure linked to perform the function of “*permit a determination as to whether* the one or more mobile device application actions including causing to be output the visual information *is triggered.*”

115. The ’584 Provisional also discloses, regarding “step 1600” of Figure 13, that “the Mobile Terminal (700) sends a data message to local Network I/O Units (420, 520, 620)”, or may “broadcast the information to other mobile terminals in the same local network or available through ad-hoc networking”, and that “Mobile Terminal (700) my[sic] generate such data messages on the basis of a variety of events, such as:

- Step 1601a: A request by the Network I/O Unit (420, 520, 620);
- Step 1601b: Location within a specified geographic region;
- Step 1601c: Location within a particular place identified by a name, encoded name number or symbol or other place attribute;
- Step 1601d: Time of day, or time elapsed since the last data transmission;
- Step 1601e: Accumulated data associated with a parameter associated with the Mobile Terminal (700) reaching a predetermined threshold (quantity, value, event, etc). One skilled in the art will recognize that the parameters associated with mobile device (700) may include operating parameters for the device or the user, or a vehicle in which the Mobile Terminal (700) is either embedded, connected or being carried;
- Step 1601f: Reception of a data trigger message from another mobile device (700) or from a device located in proximity to, or integrated with Network I/O Unit (420,520,620).” See paragraph 38 above.

116. While this portion of Figure 13 might qualify as a “flowchart,” and while it discloses various “triggers” for sending a “data message” to “network I/O units” or “other mobile terminals,” none of this discloses a specific algorithm linked to perform the function of “*permit a determination as to whether* the one or more mobile device application actions including *causing to be output the visual information* is triggered.”

117. As such, in my opinion, the ’584 Provisional does not disclose any specific algorithm, in any form, that is clearly linked to performing this recited function.

118. To the extent that Dyfan contends that the invention date of the Asserted Claims is the filing date of the ’197 Application rather the filing date of the ’584 Provisional, it is also my opinion that the specification of the ’197 Application does not disclose any specific algorithm that is clearly linked to “permit a determination as to whether the one or more mobile device application actions including causing to be output the visual information is triggered.” Rather, the specification of the ’197 Application itself confirms that any subject matter added to the ’584 Provisional is generic and void of structure.

119. For example, the specification of the ’197 Application describes that the “location based trigger for a mobile device” of Figure 3 generically involves identifying location (step 302) “in any desired manner”, and, based on the identified location, using “any type of communication” to communicate “any type of information capable of being communicated” with “any device with mobile communication capabilities” (step 304). *See* paragraphs 45-46 above. Likewise, the specification describes that the “relevancy based trigger for a mobile device” of Figure 4 generically involves receiving, “from any device and/or network component” via “any type of communication”, “any type of information” and “any data that is related to relevancy of [such] information”, where “such relevancy may be with respect to any criteria . . . associated with the

mobile device or user” and “the criteria may be used in any desired manner to determine the relevancy of the information”, (step 402), and, based on such data, performing “any other act capable of being carried out, at least in part, by a mobile device” (step 404). *See* paragraphs 47-48 above. Additionally, the specification of the ’197 Application describes that “any . . . mechanism” can be used to trigger “any one or more operations” 1501-1503 (corresponding to 1700-1720 of Figure 14 of the ’584 Provisional) or “any one or more of operations” 1401-1402a/b/c/d/e/f (corresponding to 1600-1601f of Figure 13 of the ’584 Provisional). *See* paragraph 44 above.

120. As I also identified above, the specification of the ’197 Application generically describes “user information delivery interface” of Figure 18, including that it “may be implemented in any desired manner” and “may be a component of any desired framework.” *See* paragraphs 51-52 above. Moreover, the specification generically describes “every feature disclosed herein” as “optional.” *See* paragraph 44 above.

121. While the examples in the ’584 Provisional (*see* paragraphs 37-39 and 113-116 above) and the examples in the ’197 Application (*see* paragraphs 45-48, 51-52, and 118-121 above) might enable a POSITA to develop an “application” configured to perform this specific recited function, I understand that this is not the test as to whether the ’197 Application specification discloses an algorithm for programming a general purpose computer or microprocessor to perform this particular function. In my opinion, the specification of the ’197 Application does not disclose any specific algorithm, in any form, that is clearly linked to “*permit a determination as to whether* the one or more mobile device application actions including causing to be output the visual information *is triggered.*”

D. “System” Claim Limitations in Asserted Patents

122. I have been informed and understand that the parties dispute whether various claim limitations in the Asserted Patents, which each recite “the system” of the particular claim is “configured such that” various functions are performed, are subject to 35 U.S.C. 112, ¶ 6.

123. I have been instructed by counsel to determine whether, for identified functions recited in these various claim limitations, the claim connotes definite structure for performing the identified function to a POSITA. If, in my opinion, the claim does not connote definite structure for performing the identified function, then I have been instructed by counsel that the claim phrase is subject to 35 U.S.C. 112, ¶ 6.

124. For claim phrases that are, in my opinion, subject to 35 U.S.C. 112, ¶ 6, I have been instructed by counsel to determine whether the specification discloses an algorithm for programming a general purpose computer or microprocessor to perform the claimed function.

1. “system” “... subsequent output of different visual information is caused as the at least one mobile device is moved among a plurality of the facilities of the building”

125. My opinions in this section are relevant to the following claim terms:

- “the system is configured such that, **after the indication of the user input is received and after an initial instance of the output of the mobile device application visual information including the image is caused, subsequent instances of the output of the mobile device application visual information including different images are capable of being caused as a user moves among a plurality of the facilities of the building, without requiring additional subsequent user input**” (’899 Patent, claim 1)
- “the system is configured such that, **after the indication of the user input is received and after an initial instance of the output of the visual information is caused, subsequent instances of the output of the visual information are capable of being caused as a user moves, without requiring [necessitating] additional subsequent user input**” (’899 Patent, claims 7, 9)
- “the system is further configured such that, **after the indication of the user input is received and after the output of the visual information is caused, subsequent output of different visual information is caused as the at least one mobile device is moved among a plurality of the facilities of the building**” (’899 Patent, claim 11)

- “the system is configured such that **different brand-specific visual information is caused to be output as the user moves among the plurality of facilities of the shopping mall**” (’899 Patent, claim 7)
- “the system is configured such that **different product-type-specific visual information is caused to be output as the user moves among the different locations of the retail store**” (’899 Patent, claim 9)
- “the system is configured such that **the subsequent output of the different visual information is capable of being caused without additional user input after the user input**” (’899 Patent, claim 25)
- “the system is configured such that **both the first visual information and the second visual information are output without additional user input after the user input**” (’292 Patent, claim 12)

126. The claims state that the function of the “system” is to “cause” “subsequent output of different visual information” at least (1) “after the indication of the user input is received”, and (2) “after an initial instance of the output of the visual information is caused.” ’899 Patent claims 1, 7 and 9 state that this function is also performed (3) “without requiring [necessitating] additional subsequent user input.” *See also* ’899 Patent, claim 25; ’292 Patent claim 12. I am not aware of any dispute between the parties as to the function of the “system”. In my opinion, the functionality recited in each of these limitations is not something that a general purpose computer could perform without special purpose programming.

127. I have been informed and understand that “system” has been explicitly recognized by courts as a “nonce” word, which I understand to be a verbal construct that is not recognized as the name of structure and is effectively a substitute for the term “means.” *See also* paragraph 24 above. The surrounding claim language states that “the system” includes “a building”, “at least one broadcast short-range communications unit”, “a plurality of mobile devices”, “code” (or “computer code” or “application”) “configured for execution by at least one of the plurality of mobile devices”, and “at least one server.”

128. The surrounding claim language specifies that such “code” performs the function “[in response to /after] the receipt of the response message including the particular location-

relevant information . . . cause to be output, via the at least one mobile device, the visual information based on the particular location-relevant information.” *See* paragraphs 80-81 above. As I discussed above, in my opinion, the claim language does not connote definite structure for performing this particular “causing to be output” function to a POSITA. *See* paragraphs 82-86 above. Similarly, claim language in the ’292 Patent claims specifies that such “code” performs the function “caus[ing] to be output, via the at least one mobile device, the second visual information based on the second location-relevant information” (1) “[in response to /after] the receipt of the response message including the second location-relevant information”, (2) “after the first visual information is caused to be output based on the first location-relevant information,” and (3) “after the at least one mobile device is moved in the building.” *See* paragraphs 93-94 above. As I discussed above, in my opinion, the claim language does not connote definite structure for performing this particular “causing to be output” function to a POSITA. *See* paragraphs 95-99 above.

129. For at least those reasons, in my opinion, the claim language here also does not connote definite structure for performing the additional function of “caus[ing]” “subsequent output of different visual information” at least (1) “after the indication of the user input is received”, and (2) “after an initial instance of the output of the visual information is caused” (and, for certain claims, also (3) “without requiring [necessitating] additional subsequent user input”). *See* paragraphs 82-86, 95-99 above.

130. Furthermore, here, the claim language does not even specify that such “code” performs the additional function of “caus[ing]” “subsequent output of different visual information” at least (1) “after the indication of the user input is received”, and (2) “after an initial instance of the output of the visual information is caused” (and, for certain claims, also (3) “without requiring

[necessitating] additional subsequent user input”). Rather, the claims use the “nonce” word of “system”, and do not specify whether any particular one of the “building”, “short-range communications unit”, “plurality of mobile devices”, “code” or “server”, or any particular combination of these components, performs this additional function.

131. Thus, upon review, I have concluded that the claim language does not connote definite structure for performing this additional identified function to a POSITA. And, based on my opinion and instructions from counsel regarding the applicable law, this claim phrase is subject to 35 U.S.C. 112, ¶ 6.

132. As I discussed above, in my opinion, neither the ’584 Provisional nor the ’197 Application disclose any specific algorithm that is clearly linked to “[in response to /after] the receipt of the response message including the particular location-relevant information . . . caus[ing] to be output, via the at least one mobile device, the visual information based on the particular location-relevant information.” *See* paragraphs 87-92 above. As I discussed above, in my opinion, neither the ’584 Provisional nor the ’197 Application disclose any specific algorithm that is clearly linked to “caus[ing] to be output, via the at least one mobile device, the second visual information based on the second location-relevant information” (1) “[in response to /after] the receipt of the response message including the second location-relevant information”, (2) “after the first visual information is caused to be output based on the first location-relevant information,” and (3) “after the at least one mobile device is moved in the building.” *See* paragraphs 100-105 above.

133. For at least the same reasons as I identify above, and because the claim language here does not even limit the corresponding structure to software executing on a particular component, or combination of components, of the “system”, in my opinion, neither the ’584 Provisional nor the ’197 Application disclose any definite structure, or specific algorithm, that is

clearly linked to performing the function of “caus[ing]” “subsequent output of different visual information” at least (1) “after the indication of the user input is received”, and (2) “after an initial instance of the output of the visual information is caused” (and, for certain claims, also (3) “without requiring [necessitating] additional subsequent user input”). See paragraphs 82-86, 95-99 above.

2. “system” “... the visual information is automatically caused to be output”

134. My opinions in this section are relevant to the following claim terms:

- ““the system is configured such that **the first visual information is automatically caused to be output without requiring communication of the at least one [first] message with the first broadcast short-range communications unit after the receipt of the indication of the receipt of the one or more first broadcast messages, and the second visual information is automatically caused to be output without requiring communication of the at least one [second] message with the second broadcast short-range communications unit after the receipt of the indication of the receipt of the one or more second broadcast messages**” (’292 Patent, claims 1, 15, 28)
- “the system is configured such that **the visual information is automatically caused to be output without requiring further communication with the at least one broadcast short-range communications unit, after the receipt of the indication of the receipt of the one or more messages**” (’899 Patent, claim 19)
- ““the system is configured such that, **after the receipt of the indication of the user input, the visual information is automatically caused to be output, in response to the receipt of the indication of the receipt of the one or more messages that are broadcasted after the receipt of the indication of the user input**” (’899 Patent, claim 18)
- ““the system is configured such that, **after the receipt of the indication of the user input, the first visual information is automatically caused to be output in response to the receipt of the indication of the receipt of the one or more first broadcast messages that are broadcasted after the receipt of the indication of the user input, and the second visual information is automatically caused to be output in response to the receipt of the indication of the receipt of the one or more second broadcast messages that are broadcasted after the receipt of the indication of the user input**” (’292 Patent, claims 8, 21)

135. The independent claims of the ’292 Patent state that the function of the “system” is to (1) “automatically cause to be output” “the first visual information” “without requiring communication of the at least one [first] message with the first broadcast short-range

communications unit after the receipt of the indication of the receipt of the one or more first broadcast messages” and (2) “automatically cause to be output” “the second visual information” “without requiring communication of the at least one [second] message with the second broadcast short-range communications unit after the receipt of the indication of the receipt of the one or more second broadcast messages.” Dependent claims 8 and 21 of the ’292 Patent state that an additional, particular function of the “system” is to perform the same “automatically cause to be output” “the first visual information” function but also (1) “after the receipt of the indication of the user input” and (2) “in response to the receipt of the indication of the receipt of the one or more first broadcast messages that are broadcasted after the receipt of the indication of the user input.” Dependent claims 8 and 21 of the ’292 Patent also state that an additional, particular function of the “system” is to perform the same “automatically cause to be output” “the second visual information” function but also “in response to the receipt of the indication of the receipt of the one or more second broadcast messages that are broadcasted after the receipt of the indication of the user input.” I am not aware of any dispute between the parties as to the function of the “system”. In my opinion, the functionality recited in each of these limitations is not something that a general purpose computer could perform without special purpose programming.

136. As I identified in paragraph 134 above, dependent claim 19 of the ’899 Patent states that a particular function of the “system” is to “automatically cause to be output” “the visual information” both (1) “without requiring further communication with the at least one broadcast short-range communications unit” and (2) “after the receipt of the indication of the receipt of the one or more messages.” And, as I also identified above, in similar fashion, dependent claim 18 of the ’899 Patent states that a particular function of the “system” is to “automatically cause to be output” “the visual information” both (1) after the receipt of the indication of the user input, and

(2) “in response to the receipt of the indication of the receipt of the one or more messages that are broadcasted after the receipt of the indication of the user input.”

137. Surrounding claim language in the independent claims of the '292 and '899 Patents specifies that a particular function of the “code”, which is “configured for execution by at least one of a plurality of mobile devices,” is to “receive an indication of a receipt of the one or more [first/second] broadcast messages including [different portions, values, fields, etc.]” *See* paragraphs 67-68 above. As I discussed above, in my opinion, the claim language does not connote definite structure for performing this particular “receive an indication of a receipt” function to a POSITA. *See* paragraphs 69-71 above. Additionally, surrounding claim language in the independent claims of the '292 and '899 Patents also specifies that another function of such “code” is to “[in response to /after] the receipt of the response message including the first location-relevant information . . . cause to be output, via the at least one mobile device, the [first/particular] visual information based on the first location-relevant information.” *See* paragraphs 80-81 above. Furthermore, surrounding claim language in the independent claims of the '292 Patent also specifies that another function of such “code” is to “cause to be output, via the at least one mobile device, the second visual information based on the second location-relevant information” (1) “[in response to /after] the receipt of the response message including the second location-relevant information”, (2) “after the first visual information is caused to be output based on the first location-relevant information,” and (3) “after the at least one mobile device is moved in the building.” *See* paragraphs 93-94 above. As I discussed above, in my opinion, the claim language does not connote definite structure for performing either of these this particular “causing to be output” functions to a POSITA. *See* paragraphs 82-86 and 95-99 above.

138. For at least those reasons, in my opinion, the claim language here also does not connote definite structure for performing the additional “automatically caus[ing] to be output” “the [first/second] visual information” functions recited in the above-identified claims (*see* paragraphs 134-136). *See* paragraphs 69-71, 82-86, 95-99 above.

139. Furthermore, here, the claim language does not specify that such “code” performs the additional “automatically caus[ing] to be output” “the [first/second] visual information” functions. *See* paragraphs 134-136. Rather, the claims use the “nonce” word of “system”, and do not even specify whether any particular one of the “building”, “short-range communications unit”, “plurality of mobile devices”, “code” or “server”, or any particular combination of these components, of the “system” performs this additional function. *See also* paragraphs 24, 127 above.

140. Thus, upon review, I have concluded that the claim language does not connote definite structure for performing this additional identified function to a POSITA. And, based on my opinion and instructions from counsel regarding the applicable law, this claim phrase is subject to 35 U.S.C. 112, ¶ 6.

141. As I discussed above, in my opinion, neither the ’584 Provisional nor the ’197 Application disclose any specific algorithm that is clearly linked to “receiv[ing] an indication of a receipt of the one or more [first/second] broadcast messages including [different portions, values, fields, etc.]” *See* paragraphs 72-79 above. As I also discussed above, in my opinion, neither the ’584 Provisional nor the ’197 Application disclose any specific algorithm that is clearly linked to “[in response to /after] the receipt of the response message including the particular location-relevant information . . . caus[ing] to be output, via the at least one mobile device, the [first/particular] visual information based on the particular location-relevant information.” *See* paragraphs 87-92 above. As I further discussed above, in my opinion, neither the ’584 Provisional

nor the '197 Application disclose any specific algorithm that is clearly linked to “caus[ing] to be output, via the at least one mobile device, the second visual information based on the second location-relevant information” (1) “[in response to /after] the receipt of the response message including the second location-relevant information”, (2) “after the first visual information is caused to be output based on the first location-relevant information,” and (3) “after the at least one mobile device is moved in the building.” *See* paragraphs 100-105 above.

142. For at least the same reasons as I identify above, and because the claim language here does not even limit the corresponding structure to software executing on a particular component, or combination of components, of the “system”, in my opinion, neither the '584 Provisional nor the '197 Application disclose any definite structure, or specific algorithm, that is clearly linked to performing the additional “automatically caus[ing] to be output” “the [first/second] visual information” functions recited in the above-identified claims (*see* paragraphs 134-136) *See* paragraphs 72-79, 87-92, 100-105 above.

3. “system” “... the output of the visual information is conditionally caused based on whether a mobile device-specific threshold has been met”

143. My opinions in this section are relevant to the following claim terms:

- “the system is configured such that, **the output of the mobile device application visual information [the visual information] is conditionally caused based on whether a mobile device-specific threshold has been met**” ('899 Patent, claims 4, 14)
- “the system is configured such that **the output of the first visual information and the second visual information are conditionally caused based on whether a mobile device-specific threshold has been met**” ('292 Patent, claims 5, 18)

144. Certain dependent claims of the Asserted Patents state that a particular function of the “system” is to “conditionally cause” the “output of the visual information” “based on whether a mobile device-specific threshold has been met.” I am not aware of any dispute between the parties as to this function of the “system”. In my opinion, the functionality recited in each of these

limitations is not something that a general purpose computer could perform without special purpose programming.

145. Surrounding claim language in the independent claims of the '292 and '899 Patents specifies that a particular function of the “code”, which is “configured for execution by at least one of a plurality of mobile devices,” is to “[in response to /after] the receipt of the response message including the first location-relevant information . . . cause to be output, via the at least one mobile device, the [first/particular] visual information based on the first location-relevant information.” *See* paragraphs 80-81 above. Additionally, surrounding claim language in the independent claims of the '292 Patent also specifies that another function of such “code” is to “cause to be output, via the at least one mobile device, the second visual information based on the second location-relevant information” (1) “[in response to /after] the receipt of the response message including the second location-relevant information”, (2) “after the first visual information is caused to be output based on the first location-relevant information,” and (3) “after the at least one mobile device is moved in the building.” *See* paragraphs 93-94 above. As I discussed above, in my opinion, the claim language does not connote definite structure for performing either of these “causing to be output” functions to a POSITA. *See* paragraphs 82-86 and 95-99 above. Furthermore, surrounding claim language in independent claim 11 of the '899 Patent (regarding dependent claim 14 here) also specifies that another function of such “code” (“application”) is to “permit a determination as to whether the one or more mobile device application actions including causing to be output the visual information is triggered.” *See* paragraphs 106-107 above. As I discussed above, in my opinion, the claim language does not connote definite structure for performing this particular “permit a determination” function to a POSITA. *See* paragraphs 108-111 above.

146. For at least those reasons, in my opinion, the claim language here also does not connote definite structure for performing the additional “conditionally caus[ing]” the “output of the visual information” “based on whether a mobile device-specific threshold has been met” functions recited in the above-identified claims (*see* paragraphs 143-144). *See* paragraphs 82-86, 95-99, 108-111 above.

147. Furthermore, here, the claim language does not specify that such “code” performs the additional “conditionally caus[ing]” the “output of the visual information” “based on whether a mobile device-specific threshold has been met” functions. *See* paragraphs 143-144. Rather, the claims use the “nonce” word of “system”, and do not even specify whether any particular one of the “building”, “short-range communications unit”, “plurality of mobile devices”, “code” or “server”, or any particular combination of these components, of the “system” performs this additional function. *See also* paragraphs 24, 127 above.

148. Thus, upon review, I have concluded that the claim language does not connote definite structure for performing this additional identified function to a POSITA. And, based on my opinion and instructions from counsel regarding the applicable law, this claim phrase is subject to 35 U.S.C. 112, ¶ 6.

149. As I discussed above, in my opinion, neither the ’584 Provisional nor the ’197 Application disclose any specific algorithm that is clearly linked to “[in response to /after] the receipt of the response message including the particular location-relevant information . . . caus[ing] to be output, via the at least one mobile device, the [first/particular] visual information based on the particular location-relevant information.” *See* paragraphs 87-92 above. As I additionally discussed above, in my opinion, neither the ’584 Provisional nor the ’197 Application disclose any specific algorithm that is clearly linked to “caus[ing] to be output, via the at least one mobile

device, the second visual information based on the second location-relevant information” (1) “[in response to /after] the receipt of the response message including the second location-relevant information”, (2) “after the first visual information is caused to be output based on the first location-relevant information,” and (3) “after the at least one mobile device is moved in the building.” See paragraphs 100-105 above. As I further discussed above, in my opinion, neither the ’584 Provisional nor the ’197 Application disclose any specific algorithm that is clearly linked to “permit[ting] a determination as to whether the one or more mobile device application actions including causing to be output the visual information is triggered.” See paragraphs 112-121 above.

150. For at least the same reasons as I identify above, and because the claim language here does not even limit the corresponding structure to software executing on a particular component, or combination of components, of the “system”, in my opinion, neither the ’584 Provisional nor the ’197 Application disclose any definite structure, or specific algorithm, that is clearly linked to performing the additional “automatically caus[ing] to be output” “the [first/second] visual information” functions recited in the above-identified claims (see paragraphs 134-136) See paragraphs 87-92, 100-105, 112-121 above.

4. “system” “. . . the option and the user input permit the user to [determine/influence] whether [the control of the/the] one or more mobile device application actions is [triggered/caused/based on user feedback information]” / “system” “output” “both the first visual information and the second visual information . . . based on user feedback information received from a user of the at least one mobile device”

151. My opinions in this section are relevant to the following claim terms:

- “the system is further configured such that **the option and the user input permit the user to determine whether the control of the one or more mobile device application actions is triggered**” (’899 Patent, claim 1)
- “the system is [further configured/configured] such that **the option and the user input permit the user to influence whether the one or more mobile device actions is caused**” (’899 Patent, claims 7, 9)

- “the system is configured such that **the one or more mobile device application actions is based on user feedback information received from a user of the at least one mobile device**” (’899 Patent, claim 23)
- “the system is configured such that **both the first visual information and the second visual information are output based on user feedback information received from a user of the at least one mobile device**” (’292 Patent, claims 11, 25)

152. Independent claims 1, 7 and 9 of the ’899 Patent state that a particular function of the “system” is that “the option and the user input permit the user to [determine/influence] whether [the/the control of the] one or more mobile device application actions is [triggered/caused].” In a similar fashion, ’899 Patent claim 23 (dependent on the other ’899 Patent independent claim (claim 11), states that a particular function of the “system” is that “the one or more mobile device application actions is based on user feedback information received from a user of the at least one mobile device.” Similarly, certain dependent claims of the ’292 Patent state that a particular function of the “system” is that the “output” of “both the first visual information and the second visual information” is “based on user feedback information received from a user of the at least one mobile device.” In my opinion, the functionality recited in each of these limitations is not something that a general purpose computer could perform without special purpose programming.

153. Surrounding claim language in the independent claims of the ’899 and ’292 Patents specifies that a particular function of the “code”, which is “configured for execution by at least one of a plurality of mobile devices,” is to “cause display of an option via a display of the at least one mobile device.” Surrounding claim language in the independent claims of the ’899 Patent specifies that a particular function of the “code”, which is “configured for execution by at least one of a plurality of mobile devices,” is to “receive an indication of a user input in connection with the option displayed via the display of the at least one mobile device.” As I discussed above, in

my opinion, the claim language does not connote definite structure for performing the particular “cause display of an option” functions to a POSITA. *See* paragraphs 57-59 above.

154. Additional surrounding claim language in the independent claims of the ’899 and ’292 Patents also specifies that another function of such “code” is to “[in response to /after] the receipt of the response message including the first location-relevant information . . . cause to be output, via the at least one mobile device, the [first/particular] visual information based on the first location-relevant information.” *See* paragraphs 80-81 above. Additionally, surrounding claim language in the independent claims of the ’292 Patent also specifies that another function of such “code” is to “cause to be output, via the at least one mobile device, the second visual information based on the second location-relevant information” (1) “[in response to/after] the receipt of the response message including the second location-relevant information”, (2) “after the first visual information is caused to be output based on the first location-relevant information,” and (3) “after the at least one mobile device is moved in the building.” *See* paragraphs 93-94 above. As I discussed above, in my opinion, the claim language does not connote definite structure for performing either of these “causing to be output” functions to a POSITA. *See* paragraphs 82-86 and 95-99 above. Furthermore, surrounding claim language in independent claim 11 of the ’899 Patent (regarding dependent claim 23 here) also specifies that another function of such “code” (“application”) is to “permit a determination as to whether the one or more mobile device application actions including causing to be output the visual information is triggered.” *See* paragraphs 106-107 above. As I discussed above, in my opinion, the claim language does not connote definite structure for performing this particular “permit a determination” function to a POSITA. *See* paragraphs 108-111 above.

155. For at least those reasons, in my opinion, the claim language here also does not connote definite structure for either of the additional functions of (1) “the option and the user input permit[ting] the user to [determine/influence] whether [the control of the/the] one or more mobile device application actions is [triggered/caused]” or (2) “bas[ing]” “[‘the one or more mobile device application actions’/’output’ of ‘both the first visual information and the second visual information’]” “on user feedback information received from a user of the at least one mobile device” (*see* paragraphs 151-152). *See* paragraphs 57-59, 82-86, 95-99, 108-111 above. In my opinion, the functionality recited in this limitation is not something that a general purpose computer could perform without special purpose programming.

156. Furthermore, here, the claim language does not specify that such “code” performs either of these additional particular functions. *See* paragraphs 151-152. Rather, the claims use the “nonce” word of “system.” While the claims do recite “the option and the user input”, or “user feedback information”, the claims do not specify whether any particular combination of such information, and any particular one or more of the “building”, “short-range communications unit”, “plurality of mobile devices”, “code” or “server” of the “system”, performs either of these additional functions. *See also* paragraphs 24, 127 above.

157. Thus, upon review, I have concluded that the claim language does not connote definite structure for performing this additional identified function to a POSITA. And, based on my opinion and instructions from counsel regarding the applicable law, this claim phrase is subject to 35 U.S.C. 112, ¶ 6.

158. As I discussed above, in my opinion, neither the ’584 Provisional nor the ’197 Application disclose any specific algorithm that is clearly linked to “caus[ing] display of an option via a display of the at least one mobile device.” *See* paragraphs 60-66 above. As I also discussed

above, in my opinion, neither the '584 Provisional nor the '197 Application disclose any specific algorithm that is clearly linked to “[in response to /after] the receipt of the response message including the particular location-relevant information . . . caus[ing] to be output, via the at least one mobile device, the [first/particular] visual information based on the particular location-relevant information.” *See* paragraphs 87-92 above. As I additionally discussed above, in my opinion, neither the '584 Provisional nor the '197 Application disclose any specific algorithm that is clearly linked to “caus[ing] to be output, via the at least one mobile device, the second visual information based on the second location-relevant information” (1) “[in response to /after] the receipt of the response message including the second location-relevant information”, (2) “after the first visual information is caused to be output based on the first location-relevant information,” and (3) “after the at least one mobile device is moved in the building.” *See* paragraphs 100-105 above. As I further discussed above, in my opinion, neither the '584 Provisional nor the '197 Application disclose any specific algorithm that is clearly linked to “permit[ting] a determination as to whether the one or more mobile device application actions including causing to be output the visual information is triggered.” *See* paragraphs 112-121 above.

159. For at least the same reasons as I identify above, and because the claim language here does not even limit the corresponding structure to software executing on a particular component, or combination of components, of the “system”, in my opinion, neither the '584 Provisional nor the '197 Application disclose any definite structure, or specific algorithm, that is clearly linked to performing either of the additional functions of (1) “the option and the user input permit[ting] the user to [determine/influence] whether [the control of the/the] one or more mobile device application actions is [triggered/caused]” or (2) “bas[ing]” “[‘the one or more mobile device application actions’/‘output’ of ‘both the first visual information and the second visual

information’]” “on user feedback information received from a user of the at least one mobile device” (see paragraphs 151-152). See paragraphs 60-66, 87-92, 100-105, 112-121 above.

5. “system” “. . . the particular location-relevant information is located based on the at least on[e] value”

160. My opinions in this section are relevant to the following claim terms:

- “the system is configured such that **the particular location-relevant information is located based on the at least on[e] value**” (’899 Patent, claim 28)

161. Dependent claim of the ’899 Patent states that a particular function of the “system” is to “locate” the “particular location-relevant information” “based on the at least on[e] value.” I am not aware of any dispute between the parties as to this function of the “system”. In my opinion, the functionality recited in this limitation is not something that a general purpose computer could perform without special purpose programming.

162. Surrounding claim language in independent claim 11 of the ’899 Patent specifies that “the particular location-relevant information” is “based on the at least one value”, where “the at least one mobile device” receives “one or more messages including . . . the at least one value” from the “broadcast short-range communication unit.” Surrounding claim language in independent claim 11 of the ’899 Patent also specifies that “the at least one mobile device” sends “at least one message for use in retrieving the particular location relevant information” to “the at least one server,” and where “the at least one server” retrieves “the particular location relevant information” “in response to the receipt of”, and “based on,” “the [received] at least one message” from “the at least one mobile device.”

163. I note that independent claim 1 of the ’899 Patent specifies that “the at least one mobile device” sends “at least one message *including the at least one value* for use in *locating* the particular location relevant information *based on the at least one value*” to “the at least one server,”

and where “the at least one server” *locates* “the particular location relevant information” “in response to the receipt of”, and “based on,” “the [received] at least one message *including the at least one value*” from “the at least one mobile device.” I also note that independent claims 7 and 9 of the ’899 Patent specify that “the at least one mobile device” sends “at least one message *including the at least one value* for use in *identifying* the particular location relevant information” to “the at least one server,” and where “the at least one server” *identifies* “the particular location relevant information” “in response to the receipt of”, and “based on,” “*the [received] at least one value*” from “the at least one mobile device.”

164. Here, claim 28 does not specify that “the at least one value” is sent in “the at least one message” from “the at least one mobile device” to “the at least one server.” *See* claim 11; paragraphs 160-162. And, claim 28 does not specify that the “the at least one server” performs the function of “locat[ing]” the “particular location-relevant information” “based on the at least on value.” *See* paragraphs 160-162. Rather, claim 28 uses the “nonce” word of “system”, and does not even specify whether any particular one of the “building”, “short-range communications unit”, “plurality of mobile devices”, “code” or “server”, or any particular combination of these components, of the “system” performs this particular function. *See also* paragraphs 24, 127 above.

165. Thus, upon review, I have concluded that the claim language does not connote definite structure for performing this additional identified function to a POSITA. And, based on my opinion and instructions from counsel regarding the applicable law, this claim phrase is subject to 35 U.S.C. 112, ¶ 6.

166. It is additionally my opinion that the ’584 Provisional does not disclose any specific algorithm, nor any specific structure, that is clearly linked to “locate” the “particular location-relevant information” “based on the at least on value”, and where (1) “the at least one mobile

device” receives “one or more messages including . . . the at least one value” from the “broadcast short-range communication unit”, and (2) where “the at least one server” retrieves “the particular location relevant information” “in response to the receipt of”, and “based on,” “the [received] at least one message” from “the at least one mobile device.” *See also* paragraphs 160-162 above.

167. The ’584 Provisional does disclose, regarding Figure 13, “[a]t step 1610, Network I/O Unit (420, 520, 620) receives message (1000) [sent by Mobile Terminal (700)] and adds its location information to all messages received from local mobile terminals.” ’584 Provisional at Figure 13 (step 1610), p. 25. While this portion of Figure 13 might qualify as a “flowchart,” and while it discloses a “Network I/O Unit” (*see also* para 34 above) adding its location information to a message (1000) received from a “Mobile Terminal”, it states only high level results of undisclosed programming steps, none of which include a sufficiently precise description of the structure linked to perform the function of “*locat[ing]*” the “particular location-relevant information” “*based on the at least on[e] value*” as claimed in claim 28 of the ’899 Patent. *See also* paragraphs 160-162 above.

168. As such, in my opinion, the ’584 Provisional does not disclose any specific algorithm, in any form, that is clearly linked to performing this recited function.

169. To the extent that Dyfan contends that the invention date of the Asserted Claims is the filing date of the ’197 Application rather the filing date of the ’584 Provisional, it is also my opinion that the specification of the ’197 Application does not disclose any specific algorithm that is clearly linked “locate” the “particular location-relevant information” “based on the at least on[e] value”, and where (1) “the at least one mobile device” receives “one or more messages including . . . the at least one value” from the “broadcast short-range communication unit”, and (2) where “the at least one server” retrieves “the particular location relevant information” “in response to the

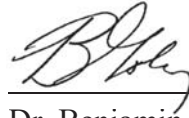
receipt of”, and “based on,” “the [received] at least one message” from “the at least one mobile device.” Rather, the specification of the ’197 Application itself confirms that any subject matter added to the ’584 Provisional is generic and void of structure.

170. For example, regarding “operation 1403” (corresponding to step 1610 of Figure 13 of the ’584 Provisional) the specification of the ’197 Application simply describes that “the network I/O unit receives the message from the mobile device and adds its location information to the message.” ’197 Application at [0070] (p. 33), Figure 14. Additionally, for example, in describing every Figure in the ’197 Application, the specification repeatedly states that “the [system/method/interface, etc.] may be carried out in the context of the architecture and environment of the previous Figures and/or any subsequent Figure(s)” and “may be carried out in any desired environment.” *See* paragraphs 42-43 above.

171. For at least these reasons, and because the claim language here does not even limit the corresponding structure to software executing on a particular component, or combination of components, of the “system”, in my opinion, neither the ’584 Provisional nor the ’197 Application disclose any definite structure, or specific algorithm, that is clearly linked to performing the function of “*locat[ing]*” the “particular location-relevant information” “*based on the at least on value*” as claimed in claim 28 of the ’899 Patent. *See also* paragraphs 160-162 above.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct.

Executed this 25th day of September in 2019.

A handwritten signature in black ink, appearing to read "B. Goldberg", is written over a horizontal line.

Dr. Benjamin Goldberg

Exhibit A

Curriculum Vitae

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Personal

Born January 31, 1961, Las Cruces, New Mexico.

U.S. Citizen.

Education

Ph.D. in Computer Science, Yale University, 1988. Dissertation: "Multiprocessor Execution of Functional Programs."

M.S. and M.Phil in Computer Science, Yale University, 1984.

B.A. with Highest Honors in Mathematical Sciences, Williams College, Cum Laude, Phi Beta Kappa, Sigma Xi, June 1982. Honors Thesis: "Theory and Implementation of an Automatic Program Verifier."

Employment

Associate Professor (Tenured), Courant Institute of Mathematical Sciences, Department of Computer Science, New York University. September 1994 – Present.

Invited Professor, Ecole Normale Supérieure, Paris, France. June 2007 – July 2007 and June 2003 – July 2003.

Director of Graduate Studies (for the MS programs), Department of Computer Science, New York University. September 2009 – August 2012 and September 2014 – present.

Director of Undergraduate Studies, Department of Computer Science, New York University. September 1995 – August 1998 and September 2003 – August 2006.

Visiting Professor, Institut National de Recherche en Informatique et en Automatique (INRIA), Rocquencourt, France. September 1994 – August 1995.

Assistant Professor, Courant Institute of Mathematical Sciences, Department of Computer Science, New York University. September 1987 - August 1994.

Expert Testimony at Trial or Deposition in the Past Five Years

Retained by Sidley Austin on behalf of Apple in the matter of *Omni MedSci v. Apple*, U.S. District Court for the Eastern District of Texas, Marshall Division. December 2018 – present.

Retained by Morrison & Foerster on behalf of IEX Group in the matter of *Nasdaq v. IEX Group* (Covered Business Method patent review before the USPTO), May 2018 – present.

Retained by Kirkland & Ellis on behalf of Apple, by Sheppard Mullin on behalf of HTC, and by McDermott Will & Emery on behalf of ZTE in the Matter of *Certain LTE- And 3G-Compliant Cellular Communications Devices* (INVT v. Apple, HTC, and ZTE), US International Trade Commission. September 2018 – present.

Retained by Seyfarth Shaw on behalf of Capstone Logistics in the matter of *Capstone Logistics v. Pedro Navarrete et al.* US District Court for the Southern District of New York. June 2018 – present.

Retained by Norton Rose Fulbright on behalf of Papa John's USA in the matter of *In Re Ameranth Patent Litigation*. U.S. District Court for the Southern District of California. December 2017-September 2018.

Retained by Latham & Watkins on behalf of Oracle in the matter of *Oracle v. Hewlett Packard Enterprise*. US District Court for the Northern District of California, San Francisco Division. July 2017 – January 2019.

Retained by Quinn Emanuel on behalf of StubHub in the matter of *Calendar Research v. StubHub et al.* US District Court for the Central District of California, Western Division – Los Angeles. September 2017-August 2018.

Retained by Arnold & Porter Kay Scholer on behalf of Google in the matter of *KlausTech v. Google*. US District Court for the Northern District of California, Oakland Division. October 2015-present.

Retained by Baker & Hostetler by intervenor IAC Search & Media in the matter of *Finjan v. Symantec*. US District Court for the Northern District of California, Oakland Division. November 2017-January 2018.

Retained by Morrison & Foerster on behalf of Nikon in the Matter of *Certain Digital Cameras, Software, and Components Thereof* (Zeiss v. Nikon), International Trade Commission. August 2017-January 2018.

Retained by Quinn Emanuel on behalf of Samsung, by Sheppard Mullin on behalf of HTC, and by Kilpatrick Townsend on behalf of Lenovo and Motorola Mobility in the matters of *Evolved Wireless v. Samsung*, *Evolved Wireless v. HTC*, and *Evolved Wireless v. Lenovo and Motorola Mobility*. November 2016-present.

Retained by Norton Rose Fulbright on behalf of Priceline, Kayak, and Open Table in the matter of *IBM v. The Priceline Group et al.*, June 2016-December 2017.

Retained by Andrews Kurth Kenyon on behalf of Viatch Technologies in the matter of *Viatch Technologies v. Microsoft*. March 2015-June 2017.

Retained by Allen, Dyer, Doppelt, Milbrath & Gilchrist on behalf of Live Face on Web in the matter of *Live Face on Web v. Major League Builders*, *Life Face on Web v. Full Service Vending*, and *Live Face on Web v. Integrity Solutions*. October 2014-October 2018.

Retained by Cooley on behalf of Apple in the matter of *Odyssey Wireless v. Apple*. March 2016-October 2016.

Retained by Milbank Tweed on behalf of Apple in the matter of *Rembrandt Patent Innovations v. Apple*, July 2015-May 2016.

Retained by Gibson Dunn & Crutcher on behalf of Facebook in the matter of *Campbell v. Facebook*, October 2015-March 2016.

Retained by Jones Day on behalf of Kyocera in the matter of *Wi-LAN v. Kyocera*, February 2015 – October 2015.

Retained by Orrick on behalf of EMC in the matter of *Oasis v. EMC et al.*, June 2014 – September 2015.

Retained by Kaye Scholer on behalf of Google in the matter of *ContentGuard v. Google* (Covered Business Method patent review before the USPTO). August 2014 – January 2016.

Retained by Fulbright & Jaworski on behalf of Qualcomm in the matter of *Certain Consumer Electronics and Display Devices with Graphics Processing and Graphics Processing Units Therein* (NVIDIA v. Qualcomm). International Trade Commission, December 2014 – June 2015.

Retained by Orrick on behalf of EMC and VMware in the matter of *Clouding v. EMC et al.* (*Inter Partes Review* before the PTO), June 2014 – July 2015.

Retained by Quinn Emanuel and Perkins Coie on behalf of Samsung, Google, and HTC in the matter of *Smartflash v. Samsung et al.* April 2014 – July 2015.

Retained by Kenyon & Kenyon on behalf of Advanced Ground Information Systems (AGIS) in the matter of *AGIS v. Life360* (Patent Litigation). August 2014 – November 2014.

Retained by Milbank Tweed on behalf of Apple in the matter of *Wi-LAN v. Apple*, February 2014 – September 2014.

Retained by Boies Schiller on behalf of InfoSpan in the matter of *InfoSpan v. Emirates NBD Bank*, September 2013 – August 2016.

Retained by Boies Schiller on behalf of Apple in the matter of *Apple v. Personal Web Technologies* (*Inter Partes Review* before the PTO), August 2013 – July 2014.

Retained by Cooley on behalf of Apple in the matter of *GBT v. Apple*, October 2013 – June 2014.

Teaching Awards

New York University "Golden Dozen" Award, 1992. Awarded to twelve faculty members in the entire College of Arts and Sciences for excellence in teaching.

Professional Activities

Editorial Board, *The Computer Journal*. Published by Oxford University Press on behalf of the British Computer Society. 2007 – 2009.

Program Committee member: 2007 Symposium on Principles of Programming Languages (POPL)

External Review Committee member: 2013 Symposium on Principles of Programming Languages (POPL)

Program Committee member: 2001 Workshop on Practical Applications of Declarative Languages (PADL'01), ACM SIGPLAN'95 Conference on Programming Language Design and Implementation, 1995 ACM SIGPLAN Symposium on Partial Evaluation and Semantics-Based Program Manipulation (PEPM '95), 1995 International Workshop on Memory Management (IWMM'95), ACM SIGPLAN'93 Conference on Programming Language Design and Implementation.

Review Panel Member, National Science Foundation, January 1998 and January 2000.

Official Collaborator, Los Alamos National Laboratory, Computing and Communications Division.

Member, Association for Computing Machinery and ACM Special Interest Group on Programming Languages (SIGPLAN).

Referee for: ACM TOPLAS, IEEE Computer, International Journal of Parallel Programming, Software Practice and Experience, Computational Intelligence, ACM TOCS, ACM Computing Surveys, etc.

Referee for a variety of ACM and IEEE conferences.

Journal Papers

"Translation and Run Time Validation of Optimized Code", with L. Zuck, A. Pnueli, C. Barrett, Y. Fang, and Y. Hu, *Formal Methods in System Design*. 27(3): 335-360, November 2005

"VOC: A Methodology for Translation Validation of Optimizing Compilers", with L. Zuck, A. Pnueli, and Y. Fang. *Journal of Universal Computer Science*, March 2003.

"A Syntactic Method for Finding Least Fixed Points of Higher-Order Functions over Finite Domains", with Tyng-Ruey Chuang. *Journal of Functional Programming*. Vol. 7, No. 4, pp. 357-394, July 1997

"Functional Programming Languages", in ACM 50th Anniversary Issue of Computing Surveys. March 1996.

"Order-of-demand analysis for lazy languages", with Young-Gil Park. *Information Processing Letters*, Vol. 55, 1995, pp. 343-348.

"Static Analysis for Optimizing Reference Counting", with Young-Gil Park. *Information Processing Letters*, Vol. 55, 1995, pp. 229-234.

"Multiprocessor Execution of Functional Programs", *International Journal of Parallel Programming*, Vol. 17, No. 5, October 1988.

"Distributed Execution of Functional Programs Using Serial Combinators," with P. Hudak, *IEEE Transactions on Computers*, Vol. C-34, No. 10, October 1985, pp. 881-891.

Books or Chapters in Books

"Functional Programming Languages", in *Handbook of Computer Science and Engineering*, CRC Press, Inc. 1996.

Publications in Proceedings of Refereed Symposia

"Translation Validation of Loop Optimizations and Software Pipelining in the TVOC Framework". Proceedings of the 17th International Static Analysis Symposium (SAS 2010), September 2010.

"TVOC: A translation validator for optimizing compilers", with C. Barrett, Y. Fang, Y. Hu, A. Pnueli, and L. Zuck. Proceedings of the 17th International Conference on Computer Aided Verification (CAV '05), July 2005.

"Theory and algorithms for the generation and validation of speculative loop optimizations", with Y. Hu and C. Barrett. Proceedings of the 2nd IEEE International Conference on Software Engineering and Formal Methods (SEFM), September 2004.

"Into the Loops: Practical Issues in Translation Validation for Optimizing Compilers", with L. Zuck and C. Barrett. Proceedings of the Third International Workshop on Compiler Optimization meets Compiler Verification (COCV). April 2004.

"Run-Time Validation of Speculative Optimizations using CVC", with C. Barrett and L. Zuck. Proceedings of the Workshop on Runtime Verification 2003, ENTCS 89(2). July 2003.

"Software Bubbles: Using Predication to Compensate for Aliasing in Software Pipelines", with E. Chapman, C. Huneycutt, and K. Palem. Proceedings of the PACT-2002 International Conference on Parallel Architectures and Compilation Techniques, September 2002.

"Translation and Run-Time Validation of Optimized code", with L. Zuck, A. Pnueli, Y. Fang, and Y. Hu. Proceedings of the Workshop on Runtime Verification 2002, ENTCS 70(4). July 2002.

"VOC: A Translation Validator for Optimizing Compilers". Proceedings of the Workshop on Compiler Optimization Meets Compiler Verification (COCV) 2002, ENTCS 65(2). April 2002.

"Formal Models of Distributed Memory Management", with Cristian Ungureanu. Proceedings of the ACM International Conference on Functional Programming, June 1997.

"Partial Evaluation of Concurrent Programs", with Mihnea Marinescu. Proceedings of the ACM Symposium on Partial Evaluation and Program Manipulation, June 1997.

"Real-Time Deques, Multihead Turing Machines, and Purely Functional Programming", with T-R. Chuang. Proceedings of the 1993 ACM Conference on Functional Programming Languages and Computer Architecture, June 1993.

"Polymorphic Type Reconstruction for Garbage Collection without Tags", with M. Gloger. Proceedings of the 1992 ACM Conference on LISP and Functional Programming, June 1992.

"A Syntactic Approach to Fixed Point Computation on Finite Domains", with T.R. Chuang. Proceedings of the 1992 ACM Conference on LISP and Functional Programming, June 1992.

"Escape Analysis on Lists", with Y.G. Park. Proceedings of the 1992 ACM SIGPLAN Conference on Programming Language Design and Implementation, June 1992.

"Incremental Garbage Collection without Tags", Proceedings of the 1992 European Symposium on Programming, February 1992.

"Reference Escape Analysis: Optimizing Reference Counting based on the Lifetime of References", with Y.G. Park. Proceedings of the 1991 ACM/IFIP Conference on Partial Evaluation and Program Manipulation, June 1991.

"Tag-Free Garbage Collection for Strongly Typed Programming Languages", Proceedings of the ACM SIGPLAN'91 Conference on Programming Language Design and Implementation, June 1991.

"Higher Order Escape Analysis: Optimizing Stack Allocation in Functional Program Implementations", Proceedings of the 1990 European Symposium on Programming, May 1990. Springer-Verlag LNCS 432, pp. 152-160.

"Generational Reference Counting: A Reduced-Communication Distributed Storage Reclamation Scheme", Proceedings of the SIGPLAN'89 Conference on Programming Language Design and Implementation, June 1989.

"A Reduced-Communication Storage Reclamation Scheme for Distributed Memory Multiprocessors", Proceedings of the Fourth Conference on Hypercubes, Concurrent Computers, and Applications, January 1989.

"Buckwheat: Graph Reduction on a Shared Memory Multiprocessor", Proceedings of the 1988 ACM Symposium on Lisp and Functional Programming, July 1988, pp. 40-51.

"Executing Functional Programs on a Hypercube Multiprocessor", Proceedings of the Third Conference on Hypercube Concurrent Computers and Applications, January 1988.

"Detecting Sharing of Partial Applications in Functional Programs", Proceedings of the Conference on Functional Programming Languages and Computer Architecture, September 1987. Published in the Springer-Verlag Lecture Notes in Computer Science, Vol. 274, pp. 408-425.

"Serial Combinators: "Optimal" Grains of Parallelism", with P. Hudak, Proceedings of the IFIP Conference on Functional Programming Languages and Computer Architecture, September 1985. Published in the Springer-Verlag Lecture Notes in Computer Science, Vol. 201, pp. 382-389.

"Experiments in Diffused Combinator Reduction," with P. Hudak, Proceedings of the ACM Symposium on Lisp and Functional Programming, August 1984, pp. 167-176.

Keynote Addresses, Invited Talks and Tutorials

Keynote Address, "Software Pipelining and Loop Optimizations in the Presence of Memory Aliasing", 8th Workshop on Compiler Techniques for High Performance Computing, Hualien, Taiwan, March 2002.

Invited Talk, "Translation Validation of Loop Optimizations", Ecole Normale Supérieure, Paris. July 2003.

Invited tutorial, "The Trimaran Compiler Research Infrastructure", given at the following conferences:

- IEEE Symposium on Parallel Architectures and Compiler Techniques (PACT'98), Paris, October 1998.
- IEEE Symposium on Microarchitecture (MICRO-31), Dallas, December 1998.
- 1999 ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'99), Atlanta, June 1999.

Tutorial, "Functional Programming", 1994 ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'94). Orlando, June 1994.

Research Grants and Contracts

"Property-Based Development of reactive and Embedded Systems", with A. Pnueli and L. Zuck. National Science Foundation, August 2007 – May 2009.

"PTV: Translation Validation in the Phoenix Compiler Framework", with A. Pnueli (coordinated proposal with L. Zuck of U. Illinois-Chicago). Microsoft, April 2006.

"A Methodology for Establishing the Dependability and Security of Telecommunication Protocols", with A. Pnueli and L. Zuck. Office of Naval Research, July 2003 – June 2005.

"Towards a Seamless Process for the Development of Embedded Systems", with A. Pnueli and L. Zuck. National Science Foundation, September 2002 - August 2005.

"Translation Validation of Advanced Compiler Optimizations", with L. Zuck and A. Pnueli. National Science Foundation, June 2001 – May 2006.

"Algorithmic Techniques for Compiler Controlled Caches", with K. Palem. Air Force, July 1999 - June 2002.

"Parallel Extensions of the MSTAR System", with E. Freudenthal. AFOSR, August 1999 - July, 2001.

"A Computational Laboratory for Automatic Target Recognition", with D. Geiger and E. Freudenthal. AFOSR, March 1998 - March 1999.

"Mobile and Stationary Target Acquisition and Recognition", DARPA/Air Force, June 1997- March 2000.

"An Integrated Parallel Programming Environment for High Performance Parallel Computing on Workstation Clusters", Department of Energy. May 1994. With Los Alamos National Laboratory and IBM.

"GRIFFIN - A Common Prototyping Language: Design, Implementation, and Assessment", with R. Dewar, M. Harrison, E. Schonberg and D. Shasha. DARPA/Office of Naval Research, May 1992 - April 1995.

"Research Training in Software Prototyping Languages and Environments". DARPA/ONR May 1992 - April 1995.

"Studies in Automatic Dynamic Load Balancing on Large Loosely-Coupled Multiprocessors", National Science Foundation Research Initiation Award. September 1989 - June 1992.

"GRIFFIN: a Common Prototyping Language", with R. Dewar, E. Schonberg, M. Harrison, and D. Shasha. DARPA/ONR September 1989 - April 1992.

New Courses Developed

"Object Oriented Programming". An undergraduate course covering Java, C++, UML, and object oriented programming techniques. Also developed an MS-level OOP course.

"The Design and Programming of Embedded Systems". A graduate course addressing the computing hardware and software designs in handheld devices, cell phones, appliances, etc.

"Compilers for Advanced Computer Architectures". A graduate course in optimization techniques for emerging microprocessors.

"Honors Programming Languages". A Ph.D. course in Programming Language Design and theory.